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CATO SYMPOSIUM ON POLLUTION

Richard Epstein — The Principles of Environmental Protection: The Case of Superfund
Comments by **Ronald Hamowy** *and* **Gerald P. O'Driscoll, Jr.**

Murray Rothbard — Law, Property Rights, and Air Pollution

Robert K. Best and James I. Collins — Legal Issues in Pollution-Engendered Torts

Sidney Shindell — Evidentiary Problems in Pollution-Engendered Torts
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Jerome W. Milliman — Can Water Pollution Policy Be Efficient?
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Peter Lewin — Pollution Externalities: Social Cost and Strict Liability

Gerald L. Sauer — Imposed Risk Controversies: A Critical Analysis
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Bernard L. Cohen — Radiation Pollution and Cancer: Comparative Risks and Proof
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Richard N. Langlois — Cost-Benefit Analysis, Environmentalism, and Rights
Comment by **Charles W. Baird**

Aaron Wildavsky — Pollution as Moral Coercion: Culture, Risk Perception, and Libertarian Values
Comment by **Manuel S. Klausner**

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INTRODUCTION

It is true that where a considerable part of the costs incurred are external costs from the point of view of the acting individuals or firms, the economic calculation established by them is manifestly defective and their results deceptive. But this is not the outcome of alleged deficiencies inherent in the system of private ownership of the means of production. It is on the contrary a consequence of loopholes left in this system. It could be removed by a reform of the laws concerning liability for damages inflicted and by rescinding the institutional barriers preventing the full operation of private ownership.

—Ludwig von Mises[1]

The papers contained in this issue have been compiled from the Cato Institute's *Symposium on Pollution* held in Palo Alto, California last December. The purpose of the symposium was to have scholars examine the legal, economic, and ethical questions surrounding pollution. We feel that a systematic presentation of the studies that emerged from Palo Alto will shed new light on the pollution problem.

In the first paper, Richard Epstein argues that the government is justified in protecting person and property in pollution-engendered torts, and contrasts this with regulation that violates individual rights. He contends, however, that the corrective justice approach is insufficient to resolve the thorny problems of factual uncertainty, choice of remedy, and enforcement of private remedies in large-number cases.

Although Epstein finds cause for government involvement in pollution, he thinks the Superfund Act is an inefficient remedy. This legislation imposes costs on the private sector *in advance* of any provable harm, increases the power of government, and does not achieve justice.

Instead, Epstein proposes government ownership of common property resources when it is too costly for markets to arise. (Rights

[1]Ludwig Von Mises, *Human Action: A Treatise on Economics,* 3d. ed. (Chicago: Henry Regnery Co., 1966), pp. 657-658.

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of use could be auctioned off to private parties.) This remedy, he contends, will help preserve the commons. As "owner," the government can initiate actions for relief by suing private parties; use a permit system to identify defendants in these actions; and clean up existing dumpsites. These public remedies could be supplemented by private actions.

Epstein cautions against placing too much confidence in government remedies and states that the key issue is "not how we can keep government out . . . but how we can design institutional arrangements that will allow it to function efficiently in a restricted area."

Murray Rothbard argues that law and ethics are inseparable: Every legal principle presupposes an ethical judgment. Thus, a consistent legal system requires a theory of rights. The libertarian principle that coercion should be limited to the protection of person and of justly acquired property is fundamental to Rothbard's reformulation of legal principles as they relate to pollution-engendered torts.

Rothbard criticizes Coase and others for acting as if the solution to the pollution problem is value-free. In Coase's familiar example, it makes no difference how rights are assigned; once liability is established, resources will be allocated efficiently. But the assignment of rights is crucial for justice. Thus, Rothbard sets about formulating a corrective justice approach to pollution.

Unlike Epstein, who argues that ethical considerations are not enough to solve the pollution problem, Rothbard attempts to apply a libertarian theory of rights to evidentiary problems and remedies. He is less concerned with government actions to lower transactions costs than with a tort system that will protect individual freedom.

Under the libertarian principle of justice, illegal acts would be confined to the use of force against persons or their property. The only acceptable remedy would be a private action under the law of torts. (Rothbard would collapse criminal law into tort law, since aggression is against individuals, not society or government.) The victim, his heirs, or assigns would act as plaintiff, and the tortfeasor would be held strictly liable. The plaintiff, however, would have to establish guilt on a strict causal basis and beyond a reasonable doubt.

These legal principles, derived from a libertarian theory of rights, would be applied to all torts, including air pollution. Moreover, Rothbard would apply the homesteading principle to pollution. If an individual had acquired a "homestead easement," he would be permitted to pollute in the same manner as before the action initiated against him.

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Robert Best and James Collins consider the legal issues of causation, harm, and standard of proof in pollution-engendered torts. They criticize the inflexibility of the current tort system with regard to these issues and propose a more flexible system.

Instead of relying on proximate cause (which is simply a convenient way to limit adjudication in tort actions by relying on conventional wisdom), they would reform the adjudication process so that new information could be incorporated immediately into tort cases involving pollution. Under their proposal, or "decision paradigm," the court would first decide upon the justiciability of the plaintiff's claim and then consider the quality of the evidence bearing on causation and harm. Most importantly, the evidence would be evaluated by a group of experts rather than an ill-informed jury.

Best and Collins argue that their reform will expand tort actions in pollution cases, reduce the scope of government action, and increase the likelihood of justice. They take Rothbard one step further by offering us a method of *implementing* libertarian principles.

Sidney Shindell considers the evidentiary problems in pollution-engendered torts from the perspective of an expert witness. How are the twin problems of causation and harm to be treated in practice?

Most of the evidence brought to bear in pollution cases is indirect; it must be inferred from the available data. This creates difficulties with respect to the standard of proof, since the courts are reluctant to rely on statistical tests showing correlation rather than causation.

Nevertheless, this is all we have to go by, and Shindell advocates improving the collection and uses of data in establishing causation and harm in pollution cases. But two questions remain: Can we afford to refine the data and statistical procedures to the point where they are useful in resolving pollution-engendered torts? And should this be a proper function of government?

The value of Shindell's study is that he reminds us that even if we establish that a tort has been committed, we must still determine the extent of harm in order to provide just relief.

Jerome Milliman's paper focuses on the question of efficiency in water pollution policy. He favors market-type solutions to water pollution and demonstrates that effluent charges and transferable permits would be more efficient than direct regulation. These approaches should be applied to point sources of water pollution. Meanwhile, cost-benefit analysis should be used to develop viable methods of dealing with nonpoint pollution, which the system of direct regulation has left virtually untouched.

The economic argument for market-type solutions to water pollu-

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tion has been ignored by policymakers. Milliman makes no attempt to explain why; this is not his purpose. The public choice literature, however, makes it clear that self-seeking government officials have a strong incentive to use government power for their own good. Thus, as Terry Anderson points out, direct regulation makes a great deal of sense from their perspective.

Peter Lewin examines the efficiency and corrective justice approaches to pollution. He sees insurmountable difficulties with the efficiency approach. In theory, a tax or effluent charge could be levied to internalize the external costs associated with pollution. But the information problems are insolvable, given the subjectivity of costs and benefits and the lack of any market mechanism to accurately reflect consumer preferences for a cleaner environment.

Since the optimal amount of pollution can never be known in the absence of a private property rights system, Lewin proposes a corrective justice approach involving strict liability in pollution-engendered torts. He reasons that the impossibility of social cost calculations makes this approach a sounder basis for pollution control, and one that is consistent with individual freedom. Under the rights approach, however, causal problems resurface along with the difficulty of estimating damages.

Thus, like Epstein, Lewin sees the fundamental importance of a *just* legal system, but recognizes the difficulty of enforcing rights in certain pollution-engendered torts. He also recognizes that government has a role to play in protecting rights, especially in the large-number case where private remedies may fail because of high transactions costs. Finally, like Epstein, he perceives the information and incentive problems inherent in government action. Unlike Epstein, however, Lewin sees *fewer* difficulties with a corrective justice approach, and would therefore adhere to it more rigorously in pollution-engendered torts.

Gerald Sauer is concerned with problems of "imposed risk" as contrasted with risks that are voluntarily accepted. Are we ever justified in preventing imposed risk? Sauer answers in the affirmative. His rationale is based on the ethical principle that individuals ought to respect others in their person and property — the imposition of *significant* risk could interfere with one's property rights. The question then arises: How is one to determine when a risk is significant?

Sauer attempts to give us a standard of risk assessment that would indicate whether an individual has a justifiable claim against the im-

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poser of risk. He rejects the utilitarian approach because of the problems Lewin refers to. Instead, he would use an "objective" measure based on relative frequencies and would allow relief through common law adjudication rather than government regulation.

Sauer wants to reform the adjudication process along lines similar to Best and Collins. He would establish the following framework for resolving imposed-risk controversies that violated his standard of risk. First, the plaintiff would present his case to an expert, who would act as "judge." At this preliminary hearing, the defendant would have the option of appearing in court. If the case were dismissed, the plaintiff would bear the legal costs. On the other hand, if the official ruled that the plaintiff had a just claim, the defendant would have to bear the burden of proof and appear before a "panel of experts."

Unlike the Best-Collins proposal that aims at justice for actual harm caused by pollution-engendered torts, Sauer's proposal is designed to restrain action *in the absence* of actual harm. Indeed, its purpose is to nip high imposed risk in the bud and thus discourage it.

Sauer's motive — the safeguarding of property from inordinate imposed risk — is admirable; however, his proposal could pose serious problems for a free society, as the Johnston comment shows.

Bernard Cohen presents a case study of the comparable risks of harm from nuclear radiation and coal burning for a given level of energy production. An expert in this field, he indicates the results that might be realized under the judicial reforms proposed by Best-Collins and Sauer.

The usual way to ascertain the danger of low-level radiation is to infer it from data on high-level radiation. Cohen notes that this methodology typically overstates the health hazards from low-level radiation. The scientific community generally accepts his claim that the danger posed by coal-burning is much greater than that posed by nuclear energy. Moreover, though the waste disposal problems confronting the nuclear energy industry are solvable, the U.S. government has postponed implementation of the known remedies.

Instead, public attention has been focused on the danger of nuclear radiation, even low-level radiation. This concern has been fostered, according to Cohen, by the media's penchant for generating bad news, even if the facts point in the opposite direction. The media find it in their self-interest (at least in the short run) to fabricate crises that produce the exciting news demanded by the public.

Cohen's media example offers a rationale for the Best-Collins pro-

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posal to adjudicate pollution-engendered torts under the guidance of reputable authorities rather than impressionable juries guided by proximate cause. Yet, the question remains: How can the adjudication system be reformed, given such perverse incentives?

Richard Langlois explains that the real debate between conservatives and environmentalists is centered not on the acceptance of cost-benefit analysis by the former and its rejection by the latter, but on their common disregard for individual rights. Both want to capture government power to impose their preferences on the rest of society. Under libertarianism, on the other hand, individuals can pursue their concept of the good as long as they respect the rights of others. Hence, unlike conservatism and environmentalism, libertarianism is neutral with respect to the good (which is subjective), but views rights as essentially negative. As Rothbard points out in his paper, individuals do not have a right to clean air; they have only a right to be protected from unjust aggression. Thus, the environmentalists' use of the "rights" concept is misplaced.

Langlois cleverly turns the tables on the environmentalists, showing that they have an obligation to employ cost-benefit analysis in the case of public property. A private owner, however, has no such obligation. This doesn't mean that Langlois regards the utility approach as morally superior to the rights approach, only that the use of the former will be conditioned by the institutional framework.

There are strong similarities between Langlois' paper and Aaron Wildavsky's. Both regard pollution as a political cause used by environmentalists in their war against libertarian values. And both help explain why government has not promoted market-type alternatives to the pollution problem.

Wildavsky sees pollution politics as a form of "moral coercion" that sectarians use to condemn the libertarian lifestyle. Libertarians are a threat to sectarians because they want individual freedom rather than equality of result. "Egalitarian sectarians" view pollution as a "moral defect" of individualism since it disrupts the "state of nature" in which everyone is presumed equal. Hence, they call for the government to protect the environment; but a deeper-seated motive is for the state to impose sectarian values on freedom-loving people.

Wildavsky concludes that pollution *as used by sectarians* cannot be a problem for libertarians; otherwise, libertarians will have to regard themselves as the cause of "social contamination." This should not, however, be construed to mean that Wildavsky sees no problem for

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libertarians in pollution-engendered torts. In such cases, libertarians should attempt to establish private property rights whenever feasible. His paper indicates the political problems in trying to do so.

J.A. Dorn
Editor

EDITOR'S NOTE:

Because of the size of the Pollution Conference proceedings, the paper by William Havender and Elizabeth Whelan, and the paper by James P. Murray, Joseph J. Harrington, and Richard Wilson will appear in the next issue of the *Cato Journal* (Fall 1982).

We wish to thank former editor Robert L. Formaini for his assistance in organizing the Pollution Conference and commissioning the papers.

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THE PRINCIPLES OF ENVIRONMENTAL PROTECTION: THE CASE OF SUPERFUND

Richard A. Epstein

Introduction

This paper addresses the important question: What is the proper role of the state in the general area of environmental regulation? The subject itself poses certain major difficulties for political theories which, whatever their differences, at least call for both a "minimal state" and a sharp limitation upon the scope and the level of government activity. This insistence upon limited government, especially in the area of economic regulation, has greater intellectual and popular acceptance today than at any time in the recent past. Even so, there remains a constant public demand for government intervention in environmental matters, even by those who see themselves as hostile to big government.

The Reagan administration has implemented a major shift in environmental policy.[1] Yet it has not denounced all forms of environmental regulation *in principle* as could well be done, for example, with government regulation of wages and prices in the open market. Instead, the change in policy has focused on questions of direction and degree: Should delays be allowed in the installation of scrubbers? In the level of EPA enforcement? The elimination of all government controls seems quite unthinkable. If anything, the bulk

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He would like to thank David Currie and Cass Sunstein for their helpful comments.

[1] A note of caution must be injected, as the question of environmental policy has two very different aspects. One involves the development and exploitation of public lands; these issues (including that of public ownership) are very different from those involving the rights and duties between private individuals, where the state acts only as umpire and not as owner. Only this second case is considered here.

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of protest comes from those who believe we have moved too fast to deregulation, not too slowly.

It could be argued that popular sentiment has nothing to do with the merits of any given position. But ethics, including legal ethics, is not a wholly logical activity to be undertaken by pure reason alone. Instead, it requires, regardless of the substantive position that is advanced, a careful interplay between individual examples and general principles. General principles are suggested by some individual examples only to be qualified by others. Better approximation and further refinement are always in order. Rawls's "reflective equilibrium" is a salutary practice regardless of whether his "difference principle" is sound on substantive grounds.[2] Moreover, any acceptance of these practical modes of reasoning does not bode well for a system which cannot account for the strongest sentiments shared by thoughtful individuals of different political persuasions and outlooks. Popular sentiment therefore should provide some kind of brake against the claims of a pure theory. Pollution is a different matter from wages and prices. So too their social regulation. A political theory that has no place for any environmental policy would be subject to reproach for its failure to make these distinctions.

Fortunately, on environmental matters, popular sentiment is not at war with pure theory. Thus I hope to demonstrate the validity of several propositions, which taken together, show the strengths and limitations of modern normative theory. First, the principles of justice that protect liberty and property often require government action for the protection of the environment against the actions of some individuals. But, second, these principles do not of themselves determine in precise form the remedial measures, nor who in the public or private sector should initiate them. Third, the selection of the proper remedy requires resolution of some knotty empirical questions by what is some form of utilitarian calculus. And fourth, the major and lasting criticism to be made of government environmental policy is not that the state has moved in areas unworthy of governmental intervention, but that its chosen modes of intervention are ill-calculated to achieve their objectives.

This paper will mainly examine the strengths and limitations of a corrective justice theory in its application to concrete legal and social problems. Dwelling on the weakness of the theory does not, however, condemn it as against any of its rivals. The particular

[2]Both conceptions are associated with the work of John Rawls, *A Theory of Justice* (Cambridge: Harvard University Press, 1971), pp. 48-51, 76-78.

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problems of proof, of uncertainty, and of large numbers are inherent in the delineation of the issues involved, and are not unique to any single theory of entitlements that is brought to bear on the general matter. A political activist concerned with environmental issues must face exactly the same choices, as it will be necessary to define those forms of conduct that are wrongful and to select the remedial tools best able to control the wrongs defined. Anyone who is interested in the control of pollution as a wrong will be required to make an analysis of the problem quite similar to the one conducted here. In order to lend focus to the general discussion, the paper is divided into two parts. The first is concerned with the general issues of environmental policy and its relationship to other questions of individual rights and social control. The second part is a detailed examination of one important piece of environmental legislation, the Superfund bill,[3] which was passed in the closing weeks of the Carter administration.

Basic Theory

It has been said — by Wittgenstein, I believe — that any philosophical system will be malnourished if fed an unbalanced diet of examples. This charge can be made with real force about modern libertarian theory. The cases seized upon to illustrate the principles of corrective justice typically feature simple facts and sharp contours, with few parties involved. One person strikes another, perhaps in self-defense; or spills grease on the kitchen floor on which a houseguest falls; or takes the property of another, which he refuses to return except upon payment of ransom. We are also given a number of examples about how individual contracts may be used successfully in order to reassign individual rights, of which perhaps the most famous is Robert Nozick's explanation of why, by historical principles of justice, Wilt Chamberlain is entitled to be rich.[4]

The central theme of all these examples is the identification of right and wrong conduct. By abstracting all questions of evidence, uncertainty, and choice of remedy, they focus solely upon the moral aspects of individual actions. From those, they then fashion the appropriate principles of right conduct, which can be extended to more complicated factual patterns. Once we understand how

[3] Comprehensive Environmental Response, Compensation and Liability (Superfund) Act of 1980, 42 U.S.C. §§9601-56 (Supp. 1981).
[4] Robert Nozick, *Anarchy, State, and Utopia* (New York: Basic Books, 1974), pp. 161-62.

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two individuals are entitled to pool their capital and form X corporation (setting aside limited liability) we understand why, without restriction, N individuals are entitled to pool their capital (or why M small corporations are permitted to pool their capital) and form General Motors without violating the rights of other individuals.[5] The repeated application of simple principles generates unique decision rules for situations with many actors and transactions. There is no sharp dichotomy between the principles of private dispute and the so-called principles of social policy. In answer to populist reformers like Justice Brandeis, the principles of justice applicable to two traders bargaining at a state fair *do* extend to the massive dealings of multinational corporations.

The elegance of this system cannot easily be denied. Yet there are clear pitfalls in this simple mode of progression. A legal system must do more than articulate substantive rules of individual conduct. In particular, it must answer three other persistent types of questions, which are especially relevant to environmental regulation. The first question concerns the proper response to factual uncertainty in individual cases; the second, the choice of remedy once the original violation of right is established; the third, application of legal theory crafted to "large number" situations. My central point should now be clear. The corrective justice theory is excellent on the articulation of basic rights and wrongs, but its power — like that of any rival theory — is blunted when it reaches the second-order questions of factual uncertainty, remedial choice, and large numbers. Let us examine each of these difficulties.

Factual Uncertainty

A legal dispute does not arise from a hypothetical case, only from a real one. In some areas of law gathering facts is no particular problem. In many tax matters, for example, all the relevant evidence is available from the documentation supplied by the taxpayer, so that the legal issues of the case are argued upon stipulations by the parties. But most litigation does not assume these simple contours. While the legal principles themselves are not in dispute, the outcome of a case will depend upon its individual facts. In determining the facts there is a constant and unavoidable tension between the twin principles of *validity* and *reliability*. In this context I do not use these terms in a novel way.[6] Validity refers to the ex-

[5] A theory of this sort is found in Robert Hessen, *In Defense of the Corporation* (Stanford: Hoover Institution Press, 1979); Roger Pilon, "Corporations and Rights: On Treating Corporate People Justly," *Georgia Law Review* 13 (1979): 1245-1370.

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tent to which a legal rule embodies the correct normative principles. It is fully satisfied when the parties are put to their proofs upon the very issues that normative theory regards as decisive. Reliability refers to the percentage of cases in which the determination of that ultimate fact is made correctly by the legal system. Ideally, there would be perfect correlation between these two measures, such that valid substantive rules would, when subjected to proof, have the highest degree of reliability. Yet all too often just rules place in issue facts that are inaccessible to the ordinary modes of proof. Across all subject areas, there is a persistent tension between these two measures, as the valid substantive rule depends upon unreliable evidence. Think of the difficulty of getting evidence about the mental state relevant to both criminal and contractual intention, and of the dependence upon overt actions or written documents to establish them.[7]

The trade-off between validity and reliability allows us to generate an infinite number of formulas to determine their combined value. Indeed, most of the intellectual energy of lawyers in private disputes has gone towards harmonizing these separate constraints. In truth, the "easy" part of legal analysis is determining the soundness of the propositions of just conduct — that individuals own their own bodies; that promises between responsible parties should be kept; that individuals should not use force or fraud against the person or property of another. The difficult task is moving between validity and reliability. The preoccupation with their integration may lead some to believe that the law itself is basically utilitarian in its concerns, so great is the emphasis upon error

[6]See, e.g., Duncan, "Contingencies in Constructing Causal Models," *Sociological Methodology,* 1969, Edgar Borgatta, ed. (validity and reliability as the two sources of error in sociological measurement). (San Francisco: Jossey-Bass, 1968), pp. 86-87.

[7]Two major illustrations of the problem are the statute of frauds and the parole evidence rule, both of which in different ways are designed to prevent fraud. The statute of frauds says generally that certain classes of contracts may be enforced only if in writing. The parole evidence rule refuses to allow evidence to either contradict or supplement a complete written expression of argument between the parties. Both of these rules have very high error costs and have spawned enormous litigation on the margin. While they cannot be condemned out of hand — a written contract for a sale of real estate is, for example, most welcome — there is an increasing tendency to accept the judgment of a great contract scholar, Arthur Corbin, who said: "Under the statute and the rule, this purpose [of preventing perjury and fraud] is only haltingly attained; and if attained at all, it is at the expense and to the injury of many honest contractors." Arthur Corbin, "The Parole Evidence Rule," *Yale Law Journal* 53 (1944): 609. For an elaboration of the role of error prevention in the law of contracts, see Richard Epstein, "Unconscionability: A Critical Reappraisal," *Journal of Law and Economics* 18 (1975): 293.

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minimization. But this conclusion is both hasty and incorrect, for we speak here only of a utilitarianism of means, and not of ends. More properly, rights questions have a certain permanence and conceptual certainty that obviates the need for constant relitigation. First- and second-order questions are both essential to the basic enterprise. The elegant solution of the matter of right does not permit us to escape the messy questions of remedies.

Choice of Remedy

I turn next to the second major complication for any legal theory: What is the appropriate choice of remedy for a violation of rights as defined by the system? It is useful to consider the point on two levels. The first concerns the choice of remedies for an admitted past violation of rights. The second adds a temporal dimension to the problem: When should remedies be granted ex ante, that is, to prevent the occurrence of a wrong? And when should they be granted ex post, to rectify a wrong that has already taken place?

1. Remedies Ex Post

We begin with the simplest situation. One individual is found to have violated the rights of another. What now is to be done? The ideal captured in the notion of "corrective justice" is to undo the wrong and to set matters as they would have been if all rights had been respected by all parties at all relevant times. With the tort of conversion, for example, this ideal translates into a desire to restore the chattels taken by the wrongdoer. In a contract to convey real property, it translates into a desire to insist, albeit on a delayed basis, on a specific performance, i.e., court-ordered conveyance of the property in question.[8] The strong moral theme is evident. The wrongdoer should not be enriched at the expense of the victim. The victim should not suffer at the hands of the wrongdoer. By this standard, damages are not acceptable because they permit the defendant to unilaterally "license his own wrong" by buying his way out of legal obligations — as set by the general law in this conversion case and by his own contract in the specific performance case.

Yet matters can get more complicated. What is to be done if the property in question is not taken but destroyed, so that restitution becomes impossible? Here our natural sense says that for want of a better solution damages should be awarded. But what is the ap-

[8]Note that the wrongdoer can still *purchase* his way out of specific performance or restoration if he chooses.

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propriate measure of the damages? Does one use market value, even when there are no organized markets, or take into account sentimental value, even when this cannot be reasonably ascertained? And how does one make the calculations in a personal injury or, worse, in a wrongful death case? Problems do not stop here. What should be done if the principal wrongdoer is not available, either through insolvency or death, to respond to the wrong that has been committed? Is it possible or principled to find a second defendant — a parent, an employer, a retailer — who can be held responsible? Another problem arises if the wrong is not quickly discovered. A may take chattel from B, yet before B learns of the error, the thing is sold to C for its fair value. C divides it into two parts, one of which is incorporated into C's building and the other is consumed to produce goods for sale to other parties. Do we have damages, partial restitution, or recovery of lost profits?[9]

2. Ex Ante or Ex Post?

The second aspect of the remedial problem is equally important and may be more difficult. At first, one might insist that the prevention of harm is always better than its cure — for only prevention eliminates the forced exchange instead of completing it. And in some limited cases — i.e., an injunction for a deliberate, imminent, and serious harm — this is indeed a workable solution.

All cases, however, are not so easy, for again one must confront the question of uncertainty of future outcomes. Assume for the moment that it is accepted as an ethical proposition that forced exchanges are inappropriate. How does this help in the case of uncertainty just given? Suppose, for example, one wants to prevent *all* tortious automobile accidents on grounds that compensation ex post is inadequate. The only possible solution is a prohibition

[9]The same type of complications can arise in contract situations. A does not perform a promise he owes to B. What are the remedies open to B? In some cases — typically of "major breach" — he can refuse to perform and sue for damages at the same time. In other cases, he must perform and sue for damages, or sue for damages only after mitigating losses, or claim some set-off against full performance. No general theory that tells us that promises should be performed will develop a necessary connection between the theory of breach and the unique choice of remedy; even specific performance can be waived in advance of breach. One must know something about the nature of the promise, the options open to the parties, and the general commercial setting before any informed judgment can be made. For a statement of some of the relevant circumstances for making judgment, see Judge Cardozo's opinion in *Helgar Corp. v. Warner's Features,* 222 N.Y. 449, 119 N.E. 113 (1918) on remedies for breach of installment contracts.

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against *all* driving. This will make all individuals safe, but only in their role as possible plaintiffs. It will not, however, permit them to exercise their basic liberties (as drivers) in their role as possible defendants. The prohibition sweeps too wide, as it prevents lawful as well as unlawful acts.

The comprehensive injunction will not do, because it mandates a restriction on protected liberties. But there is no escape from the basic problem by opting for no injunctive relief at all. In this situation there is no risk of prohibiting those from driving who should be entitled to drive, but there may be insufficient protection for those hurt by the driving of others. The point is that personal injury, and especially death, cannot be undone by any payment of money. Even if the defendant is solvent and the injury repairable, there is still the element of the forced exchange. When the two aspects of the transaction are viewed together, the payment of damages must be viewed as the completion of a transaction that originated in the wrong of the defendant. But that is the less troublesome case, for the injustice will be all the greater if the defendant is insolvent, or beyond the jurisdiction.

It follows, therefore, that unless we can plot the future course of events with complete certainty, there must be of *necessity* some violation of individual rights. It follows as well that the choice between remedies ex ante and remedies ex post will depend at least in part upon the desire to minimize the sum of errors from the different sorts of remedial strategies.

Large Number Cases

The problem of remedial choice is further exacerbated in practice by the special demands imposed by the large number case. Here I do not refer to any bare assertion of individual rights that necessarily imposes correlative duties upon many individuals. Any individual claim of ownership must be good against the rest of the world. Ownership, far from being a creature of private contract, is the institution that private contract itself presupposes.[10] Instead, the question of large numbers is vital only where there are actual or threatened violations of individual rights, whether or not defined as rights in the person or in private property. In principle, these violations are amenable to a rule of decision that — putting aside the

[10]Note that the right *to* contract cannot be explained by contracts themselves. Instead, it is a property right good against the rest of the world, which is protected by its appropriate set of tort actions — those directed against the interference with prospective advantage.

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questions of factual uncertainty and remedial choice — poses no threat to the integrity of the basic system of rights. Each of the claims should be resolved on its individual merits. The system, therefore, operates by a kind of brute intellectual force. The rules to solve one individual case can, by repeated application, solve all similar cases. Every nuisance, for example, may be remedied by damages or injunction, no matter how trivial or widespread. Large cases simply decompose into smaller ones.

The argument from principle, however, is deeply flawed because it ignores the massive costs of legal enforcement. There are simply not enough resources to resolve all individual cases on their individual merits. Consider the problem of highway accidents and the possibility of private injunctive relief. Can each individual seek to enjoin all other individuals whom he regards as high-risk drivers? Not if the process itself is to survive degeneration. The number of suits would be unworkable, and their merits obscure. Some centralization of the injunctive relief is desirable and appropriate; hence, licensing as a public measure complements private damage actions.[11] To be sure, licensing can be turned to illicit ends, e.g., the suppression of entry into certain markets, and its operation for legitimate purposes may be clumsy and awkward. But even with these important objections, there is no clear-cut argument for putting all remedies in private hands.[12] A remedial system, incorporating individual rights to liberty and property, must consider the full mix of ex ante and ex post, private and public, in its operation.

The corrective justice theory sets out clearly what paths are permissible for individuals to travel, but does not determine what should be done to prevent people from straying from the road in the first place, or for taking them out of the ditch along its side. I now

[11] On the continuum between public and private remedies for various wrongs, see Guido Calabresi, *Costs of Accidents* (New Haven: Yale University Press, 1970), pp. 113-29; Richard Epstein, "Automobile No Fault Plans: A Second Look at First Principles," *Creighton Law Review* 13 (1980): 778.

[12] The question of public control could be avoided entirely by adopting a system of private roads, even in major urban centers. But even under ideal conditions, it is difficult to believe that this system would continue to command popular support; today the problems of converting from a public to a private system are quite insuperable. Nor would a successful conversion eliminate the objection raised here, for it is still possible that those *off* the highway could seek to enjoin activities *on* the highway on the ground that their homes, shops, and persons are placed in peril by the activities of certain drivers. That such actions would be inappropriate testifies to the difficulty of having only private causes of action, even under an ideal system of property rights.

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will consider the interaction of first order questions of the delineation of rights and second order remedy questions in environmental issues. In principle these are no different from the problems that arise in other substantive areas regulated by law. In practice, however, the second order problems are acute, not because of any weakness of substantive theory, but because of their own inherent nature.

Theory of Environmental Losses

Turning to the area of environmental law, the first question is whether pollution is a type of wrong that justifies the application of the coercive power of the state. The easiest approach is to move by degrees from the most paradigmatic of wrongs, the taking of another individual's private property. Limiting ourselves to cases dealing with actual or threatened destruction, the key assumption of the entire law of torts is that the destruction of private property is to be treated as though it were the taking of private property.[13] There is, to be sure, distinction between destroying a thing and transferring its possession from its rightful owner to another party. Yet that distinction does not, and should not, remove the owner's mantle of legal protection in cases of destruction. It only means that one remedy — restoration — is made unavailable. It doesn't mean that a second remedy of damages should be denied as well, or that injunctive relief is uniformly inappropriate.

The second question to consider is whether pollution in one form or another be regarded as a destruction of property, or harm to the person. Within the traditional language of tort law, the question is whether the harm visited is sufficiently close to the defendants action so that the action can be regarded as a cause of the harm. Here, of course, the simplest cases of harm are those that involve the direct application of force by one person to the person or property of another — *corpore corpori* as it was termed by the Romans.[14] Yet no legal system has ever said that the strongest instance of causation limits the full range of the concept. Instead, the question is

[13]This particular move has been made in connection with the eminent domain clause, which provides: "nor shall private property be taken for public use without just compensation." See, e.g., *Pumpelly* v. *Green Bay Co.*, 80 U.S. (13 Wall.) 166 (1872); *Richards* v. *Washington Terminal Co.*, 223 U.S. 546 (1914).

[14]Thus the classification that is developed in the Lex Aquilia, *D.* IX. 2. For an exploration of the principle and its limitation, see Frederick Lawson, *Negligence in the Civil Law* (Oxford: Clarendon Press, 1950), pp. 14, 22-27; W. Buckland, *A Textbook of Roman Law*, (Cambridge: Cambridge University Press, 1963), p. 589.

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what type of intervening acts and events can be added to the chain of causation in ways that extend, but do not break it.[15] One obvious example of a successful extension of the chain is a case in which one person sets a concealed trap that is triggered by the step of an injured party.[16] One obvious example of a connection too "remote" is where one individual gives a kitchen knife to another individual who (having no personal disability) uses it to cause harm to himself or to some third party.[17]

The question in the nuisance and pollution context is, on which side of the line do the cases fall? And here, while there may be some idiosyncratic cases at the margin, there is no question in any lawyer's mind that ordinary cases like discharge of pollutants into rivers and underground waters constitute infliction of harm or the destruction of another individual's property. The entire tort of nuisance is ancient, and it does not depend in the least upon any modern impulse of wealth redistribution.[18] Even the Supreme Court, which on too many occasions has taken an unduly restrictive interpretation of the eminent domain clause, recognizes that the creation of a nuisance is tantamount to the taking of private property.[19] There is no reason why one should dispute this sensible conclusion, although there is no logical contradiction in asserting that taking private property is wrongful while polluting it is not. Actually, the phrase "environmental protection" is misleading because it suggests that the environment itself, far from being some vast and impersonal force, enjoys a recognized status as a holder of rights.[20] But few are misled by the metaphor. Most environmental claims can be translated into claims of individuals protecting person and property against the wrongful acts of other individuals. With that much understood, it is then indefensible to treat pollution as the exercise of a natural right, which deserves the same hands-off attitude

[15] See for the classical statement, Herbert Hart and A. Honore, *Causation in the Law* (Oxford: Clarendon Press, 1959). For my views on the subject, see Richard Epstein, "A Theory of Strict Liability," *Journal of Legal Studies* 2 (1973): 151.

[16] See, e.g., *Bird* v. Holbrook, 4 Bing. 628, 130 Eng. Rep. 911 (1825).

[17] Many more difficult issues arise with the so-called problem of negligent entrustment, like when a loaded gun is given to a child or left standing in a place to which the child has general access. See, e.g., *Reida* v. *Lund,* 18 Cal. App. 3d 698, 96 Cal. Rptr. 102 (1971).

[18] For a collection of the older materials, see C. Fifoot, *History and Sources of the Common Law* (London: Stevens & Sons, Ltd., 1949), pp. 3-24.

[19] See, e.g., *United States* v. *Causby,* 328 U.S. 256 (1946); *Richards* v. *Washington Terminal Co.,* 233 U.S. 546 (1914).

[20] Cf. Christopher Stone, "Should Trees Have Standing? — Toward Legal Rights for Natural Objects," *S. Calif. Law Review* 45 (1972): 450.

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as competition, and even monopoly.[21] Some environmental protection is required by a strong theory of rights. The real debate must be over how that theory should be implemented.

The practical difficulties that must be overcome by a sensible theory of environmental protection include enormous questions of evidence. A farmer complains that his crops have been destroyed because of a miner's contamination of the ground water. One must still find the facts to establish each link in the chain of causation. The first important question is to determine which *substances,* alone or in combination, have caused the harm. That inquiry is by no means trivial, as many different pollutants can enter a given water system at different times and in different quantities. Some of these may prove stable and others not. The re-creation of past conditions often poses enormous challenges when the evidence is available, and insuperable obstacles when it is not. To add to the difficulty, causation in the legal setting requires proof not only of what substance did what harm, but also of matters of *attribution,* of which individual or individuals were the source of the substance that did the harm.[22] Again, the trail of evidence is apt to come to a dead end when it is needed most. When one party is implicated it may escape detection, and when many are responsible it may be impossible to apportion the damages among them in a rational and fair manner.[23]

There is also the problem of estimating monetary damages. At a minimum, that task requires some assessment of the profits that were lost through the pollution (both for the current and for future growing seasons) and some assessment of the possibility for the aggrieved party to mitigate the loss in question upon its discovery — both formidable tasks indeed. By adopting a strict liability posi-

[21] On the question of monopoly, see my *Private Property and the Public Domain* (forthcoming in NOMOS series) where I advance the argument that monopolization cannot be considered a private wrong on a par with the use of force and fraud.

[22] On the importance and uniqueness of the attribution question, see Hart and Honore, pp. 58-64. For its acute presentation, including cases, *Sindell* v. *Abbott Laboratories,* 26 Cal 3d 588, 607 P.2d 924, 163 Cal. Reptr. 132 (1980).

[23] The question of comparative responsibility is one for which no clear solution has emerged. The simplest answer is equal proration among parties, but this ignores the possibility that differential inputs can be identified and weighed. Yet the individual weighing itself leads to high administrative costs and great uncertainty. The case law dealing with this question has not been illuminating. On apportionment between a plaintiff and a defendant, see, e.g., *Li* v. *Yellow Cab Co. of Cal.,* 13 Cal. 3d 804, 532 P.2d 1226, 119 Cal. Reptr. 858 (1975). On apportionment among defendants, see, e.g., *American Motorcycle Assn.* v. *Superior Court,* 20 Cal. 3d 578, 578 P.2d 899, 146 Cal. Reptr. 182 (1978).

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tion,[24] we can eliminate the need to take evidence on the distraction of whether the defendant has taken reasonable precautions to prevent the harm. But even with this desired simplification, pollution cases, after the fact, can easily turn into extensive brawls that will test the capabilities and patience of any court.

The simple case of farmer against miner also illustrates the recurrent tension between damages and injunctive relief. Is there any reason why the farmer should have to establish all elements of the damage claim when it is possible to enjoin the discharge of pollutants in the first place? However attractive this might sound in principle, there still are problems. If it is difficult to identify the source of pollution after it has caused harm, it is even more difficult beforehand. And even if that problem can be overcome, there is still the issue of how deeply the injunction should cut into the activity of the defendant. Shutting down his mining operations may be one, albeit extreme, alternative, but portions of those operations may pose no threat at all to the protected interests of the plaintiffs. As for the potentially harmful operations, less restrictive alternatives might provide nearly complete protection against all actual physical harms. Given the constant dangers of error and overbreadth, a strong moral preference for injunctive relief cannot be decisive in every case, especially as the prospect of damage awards still functions as an imperfect deterrent.

Moreover, there is still the question of what should be done with the large number cases. Contaminants are very mobile. Many individuals may combine to pollute certain water supplies that are used by large numbers of other individuals. Indeed, it is very easy to imagine cases, such as air pollution, in which some individuals both create and suffer from the very pollution that is sought to be regulated. In this environment the private action, be it for damages or injunctive relief, may prove to be inadequate for the task at hand, and may require some collective remedial response. There is no doubt that the errors in such an approach could be serious and the costs of its administration high, but the risks of government inaction also are great. The conditions of environmental cases therefore call for a specific examination of private liability rules and

[24] See Richard Epstein, "Nuisance Law: Corrective Justice and Its Utilitarian Constraints," *Journal of Legal Studies* 8 (1979): 49, 58-60, 66-68. The matter has become more confused. Compare the relatively straightforward rule for ultrahazardous activities developed in the Restatement (First) of Torts, §§519-20 (1934), with those which have been adopted in the Restatement (Second), §§519-20 (1965). The long list of factors relevant to liability introduces an enormous amount of uncertainty into any individual case.

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government regulation as direct substitutes for each other. Consider how the Superfund legislation handles the remedial problem.

Superfund

The Superfund legislation is best understood as a comprehensive attack on the release of toxic substances into the general environment. The statute covers all situations in which an owner-occupier of a facility or vessel discharges a hazardous substance into the environment. As defined by the statute, the term "hazardous substance" includes all substances *designated* as such, either under this statute or others now enforced by the E.P.A.[25] "Release" covers spilling, leaking, pumping, discharging, etc. — virtually any way one could devise to move a hazardous substance from the possession of an owner or occupier into the general environment.[26] "Environment" includes everything within the United States and its navigable waters, whether or not subject to private ownership.[27] Perhaps most important a "facility" includes:

> . . . (A) any building, structure, installation, equipment, pipe or pipeline (including any pipe into a sewer or publicly owned treatment works), well, pit, pond, lagoon, impoundment, ditch, landfill, storage container, motor vehicle, rolling stock, or aircraft, or (B) any site or area where a hazardous substance has been deposited, stored, disposed of, or placed, or otherwise come to be located; but does not include any consumer product in consumer use or any vessel[.][28]

To analyze these definitions in the abstract can serve no useful purpose. The central inquiry is the way in which they tie into the three remedial programs of the Act: Its *notice, liability,* and *taxation* provisions. The notice provisions apply to both the ownership of certain toxic substances and their release into the environment. The liability rules contemplate both public and private actions against any person involved in the distribution or release of toxic substances. The tax rules create a special fund — Superfund — to compensate the victims of improper release of toxic substances.[29] These revenues are derived from three sources: Excise taxes upon the sale of toxic substances, moneys recovered from the violators of the other statutory provisions, and direct congressional appropriations.[30]

[25] Superfund Act of 1980, §9601(14).
[26] Ibid., §9601(22).
[27] Ibid., §9601(8).
[28] Ibid., §9601(9).
[29] Ibid., §9601, 9631.

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The objections to the statute lie not in its insistence that pollution is a tort, but in its choice of remedies and its unwarranted expansion of governmental power. To demonstrate the point, it is necessary to examine individual provisions in some detail.

Notice

One type of notice provision in the statute requires persons in charge of a covered vessel or facility to notify the E.P.A. of any known release of a hazardous substance.[31] To be sure, the central collection of release information is desirable, but the information will cost a good deal to collect. Consider the compliance costs of a large organization. The provisions of the Act must be made to all employees who have, or may acquire, information relevant to its enforcement. A central source within the firm must collect the information, verify its content, and evaluate its relevance. The direct costs of each of these operations — all repeated countless times — is evident enough, and so too the indirect costs incurred since firms must alter their ways of doing business, not so much to avoid environmental harm, but to comply with the statute. And to what benefit? The mass of information generated from all sources cannot be assimilated by public officials or used to direct government initiatives.

Here, modesty is a virtue, and the statute should have targeted its notice provisions to those occasions where the information collected will do the most good. The broad definition of a "facility" is clearly counterproductive because it does not even attempt to distinguish between a major spill of a dangerous chemical from a tank car that imperils a nearby town and the leakage of a couple of ounces of cleaning solution on a small farm that may discolor the farmer's furniture.[32] Indeed, to use a term like "facility" in this context is wholly inappropriate. Instead, those types of mainline facilities — rail cars, grain silos, etc. — which present the greatest peril should be identified within the statute, leaving all other cases to private action, if damages reach the level where such action is appropriate.

If the notice requirement of actual spills seems too broad, the second type of notice provision is even more so. It requires the owner

[30] Ibid., §9631(b).
[31] Ibid., §9603(a).
[32] The exclusion of consumer products is a thoroughly inadequate barrier to the extension of the act for even the most trivial releases, which can also occur in an industrial or commercial setting.

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or operator of all facilities to file with the E.P.A. a notice that identifies the facility, the hazardous substances that it contains, and possible releases that might have occurred. Again, the point is not that it is improper to have remedies in advance of harmful release, but that these notice provisions will increase paperwork without pinpointing those areas in which active intervention is appropriate. A better approach makes a more sensible use of scarce resources: Collect data that will permit identification of places for which first inspection, and then intervention, might be appropriate. "Orphan" dumpsites are major sources of pollution, for which private forms of injunctive relief are difficult to coordinate and control.[33]

Liability

The liability provisions under the Act[34] are somewhat more difficult to analyze. I will consider (1) the nature of the interests to be protected, (2) the parties against whom liability can be imposed, and (3) the nature of the remedies that should be made available.

1. Protected Interests

The scope of the protected interests under the Act includes quite simply all aspects of the environment.[35] Here the definition is somewhat broader than the class of protected interests at common law, which included only those things in the environment that had been reduced to private ownership and control. The expansion of the government power in this connection is, however, fully defensible. There is a well-documented body of literature that indicates that a system of common law rights and remedies fails most completely in the protection of unowned things.[36] The great danger is that such things will be either destroyed or captured so rapidly as to not take into account the long-term consequences of individual actions. To remedy this premature exhaustion of the common pool, it is necessary to put someone in the position of an owner. Leaving the question of federal or state government aside, the state, as repre-

[33] The Resource Conservation and Recovery Act of 1976 (RCRA), 42 U.S.C. §§6901-87 (1977), adopted a modified form of this position, requiring a listing of current generators, transporters, and storers of defined categories of hazardous wastes. (§§6921-25). The chief problem remaining after RCRA was "orphan dumpsites" — those dumps for which no responsible party could be found.

[34] Superfund Act of 1980, §9607.

[35] Ibid., §9601(16).

[36] See, e.g., Sweeney, Tollison, and Willett, "Market Failure, the Common Pool Problem, and Ocean Resource Exploitation," *Journal of Law and Economics* 17 (1974): 179 (and papers cited therein at notes 2-3).

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sentative of all individuals, is better able to fulfill that function than any other single individual or group of private individuals. Moreover, the introduction of the state as a possible plaintiff does not require the introduction of any extensive administrative apparatus, the levying of any additional taxes, or the invention of any new substantive rules. Instead, unowned things are placed on a par with those that are owned in their protection against destruction by pollution. The ease of fit of the newfound public remedy into the set of available private remedies makes this one of the simpler and more attractive features of the Act.

2. Parties Liable

The statute is badly flawed, however, in setting the rules choosing the proper defendants in pollution cases. Here, the basic principle of the statute seems to be *joint strict* liability. Of these two elements there is little reason to question the strict liability of the party responsible for the release of hazardous substances. The general common law, and a strong normative theory, both suggest that an individual should be held responsible for the harmful consequences of his own actions, even if he attempted with all reasonable care not to inflict harm upon his neighbor.[37] The real question is not whether liability should be strict, but on which parties the strict liability should be imposed, i.e., joint liability.

In dealing with joint liability, it is important to distinguish two situations. The first involves the release of pollutants from two separate sources. The second involves a single release of hazardous substances, which has at one time or another been in the possession of several different parties. In the first situation, rules of joint liability are inescapable. Some effort should be made to isolate the damages attributable to each of the parties, but there is no set of abstract rules that will eliminate an enormous amount of messiness in litigation. The statute left this question unresolved, and there is little to criticize it on this score, given the inability in the general literature of identifying a unique set of workable rules.

The second question is the important one. The statute, in a mistaken extension of the salutary principle of strict liability, contains a long list of individuals who can be held strictly liable for a release. The list includes, as best as can be determined, everyone who has ever possessed the substance and every person, whether

[37] See note 15 for my views, which are far from universally held. See, e.g., Richard Posner, "A Theory of Negligence," *Journal of Legal Studies* 1 (1972): 29; Oliver Holmes, *The Common Law* (Boston: Little, Brown & Co., 1881), pp. 77-84, 88-96.

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or not a possessor, who aided in any way its movement in the stream of commerce.[38] The liability imposed includes not only the damages to those parties who have suffered harm from the release, but also for all the various remedial and "response" actions undertaken by the government, and in some instances by private parties, to prevent threatened releases or to mitigate losses when they occur.[39]

The major assumption behind the liability provisions seems to be that the more parties who are held strictly responsible, the greater the degree of compliance.[40] But this argument misses the simple but important point that the positive incentives generated by the statute are necessarily limited by the total amount of damages that can be recovered from all interested parties.[41] Insisting that defendant B can be joined to defendant A only serves to *reduce* the costs of A of noncompliance with the Act. Instead of knowing that he alone will be required to bear the full brunt of the liability rules, A now knows that some other party may be required, either by direct action or by suit for contribution and indemnity, to be responsible in part for the losses. As the party in possession of the hazardous substance just

[38] Superfund Act of 1980, §9607(a)(1)-(4), which provides:

> (1) the owner and operator of a vessel (otherwise subject to the jurisdiction of the United States) or a facility,
>
> (2) any person who at the time of disposal of any hazardous substance owned or operated any facility at which such hazardous substances were disposed of,
>
> (3) any person who by contract, agreement, or otherwise arranged for disposal or treatment, or arranged with a transporter for transport for disposal or treatment, of hazardous substances owned or possessed by such person, by any other party or entity, at any facility owned or operated by another party or entity and containing such hazardous substances, and
>
> (4) any person who accepts or accepted any hazardous substances for transport to disposal or treatment facilities or sites selected by such person, from which there is a release, or threatened release which cause the incurrence of response costs, of a hazardous substance, shall be liable[.]

In particular, no one is quite sure who is covered by (3).

[39] Ibid., §9607(a)(A)-(C).

[40] The basic point is missed in Note, "Allocating the Cost of Hazardous Waste Disposal," *Harvard Law Review* 94 (1981): 584, 588:

> Deterrence can be achieved by bringing economic pressure to bear on any or all of the various firms associated in some way with hazardous wastes: waste disposers, transporters, firms that generate the wastes, and even firms that supply the waste generators with their raw materials. The waste generator is the firm that first acquires the information and control necessary to direct effectively the disposition of its wastes. Subsequent firms handling the wastes should also be able to ensure proper disposal. A rule of joint and several liability of waste generators, transporters, and disposers is thus desirable.

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before its release is normally in the best position to avoid the harm, it follows that the joint liability provisions of the act may transfer incentives from the parties against whom they are likely to be most effective to others who can do little, if any, good at all. The dissipation of incentives also brings in its wake a major increase in administrative costs since every release case will require courts to sort out the rights and wrongs of many different parties, without any good method for apportioning liability among codefendants.

The mischief created by the liability provisions is compounded further by a provision that says that no contract for indemnity or contribution among the codefendants should be respected.[42] One reason for this provision is to spare small operators an enormous liability they would otherwise assume by agreement in order to obtain the business of the giant corporations. Yet this argument assumes, as do all arguments against freedom of contract, that small firms will as a matter of course enter into arrangements under which they expect to lose money. In truth, the great advantage of these side contracts is that they reduce the scope of regulation, and correct its errors, without really reducing those benefits that the liability rules could secure.

Whether these arrangements would make the party in possession at discharge solely responsible for losses under all circumstances, or whether they would permit an action over under the contract after liability is fixed, or even after suit is brought is not clear a priori. In most circumstances, it seems probable the parties would ban all forms of contribution or indemnification. Suppose that a suit under the act is brought against the operator of a dumpsite. He may well have received his raw materials from many independent parties, and it will be difficult, if not impossible (especially in the case of threatened releases) to determine *which* supplier generated the hazardous materials for which it is now exposed to liability. Instead of risking a large number of pointless actions over, the dumpsite

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[41] This argument is made in somewhat different form by William Landes and Richard Posner, "Joint Multiple Tortfeasors: An Economic Analysis," *Journal of Legal Studies* 9 (1980): 517. They favor a rule that prohibits contribution among tortfeasors, notwithstanding any apparent unfairness about having one defendant shoulder the entire loss at the whim of the plaintiff. In their view, if defendants are risk averse, a rule which subjected them to uncertainty is apt to have superior deterrent effects. It if is possible to identify certain parties who are unlikely to control loss, the best way to get the proper deterrent effects is to exclude them from the system of liability altogether by channeling liability through a single defendant instead of spreading it over all possible defendants.

[42] Superfund Act of 1980, §9607(e)(1).

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operator, for an additional charge, could accept the full costs of the liability himself, obtaining his needed protection against other individuals by setting the terms (prior inspection, certain types of containers, etc.) by which he will accept the hazardous substances. The effect of the contracts, therefore, is to induce the proper conduct of all individuals within the chain of distribution. And even where some indemnity is allowed it can be structured and defined through choice of forum, damage, or liability rules — to correct any errors that are created by the basic liability provisions. The statute, however, forestalls such corrections, guaranteeing that its mistakes in assigning liability for loss are preserved.

The weakness of the statutory system suggests a superior alternative. Liability under the Act should be limited to the party in possession who, in turn, should be entitled to adjust his rights and duties by contract with other persons in the chain of control. One advantage of this rule is that it makes relatively clear who is caught by the Act and who is outside its provisions. Another advantage is that it would reduce the number of parties in litigation and thus channel enforcement resources where they are apt to do the most good. In addition, the system would reduce the strains on the insurance mechanism. It is quite clear that a party that deals with hazardous substances must prove his financial responsibility. The elimination of joint liability within a single chain of distribution makes it easier to insure defendants, at high limits, for a limited and well-defined class of occurrences. There is little sense to a system that requires the operator of a railroad car to insure its cargo long after it has left the railroad's possession. How does an underwriter determine the premium needed to cover the risk if materials are shipped to 100 different dumpsites? Instead of thinly spending the dollars available for insurance coverage, we need a system that focuses risk. Should insurers desire diversification, they can get it by expanding their book of business, by reinsurance, and other contractual mechanisms.

The system that ties liability to possession must be modified to prevent any party in possession from escaping liability by delivering hazardous substances to insolvent parties. Yet joint liability is an excessive response to this danger, since the problem is better handled by some form of a permit system (which, in fact, is now required by the Resource Conservation and Recovery Act).[43] The permit system requires that a hazardous substance be identified in some way. For most manufactured substances, a list of the sort con-

[43] RCRA, §6922(5).

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templated by the Act is probably required. For waste materials some type of comprehensive permit can be easily devised.[44] The regulation does not handle the liability questions, but only identifies proper defendants. Such intervention is minimal, and it is structured in ways to limit its impact upon freedom of contract. In contrast, liability under Superfund suffers from a massive case of overambition in its primary liability rules.

3. Remedies

The remedial provisions of the liability section are also suspect in a number of ways. Provisions that require compensation for the actual harms inflicted are sound enough, and are (at least for the party in possession) incorporated into any sensible system of nuisance law. Under the Act, the key question concerns the liability of private parties for the various types of remedial and response actions by the government *in advance* of the particular harm. In essence, the statute takes the position that the government has broad discretion in the types of actions it can take to prevent threatened harms,[45] while the individual defendants must, within broad dollar limits, reimburse the government for all its expenses.[46] The provision allows — but by no means guarantees — effective government action against major spills and the like. Yet it also poses the risk that the government will overestimate the dangers involved, spend enormous amounts of money on prevention, and charge those sums to private parties who were better able to control the danger in the first place. The statute itself allows the government to relocate individuals, condemn properties, and redo the landscape with dikes, ditches, etc.[47] Clearly, some control on its excesses is required.

It is never exactly clear how to balance the two dangers, but at

[44] See 40 C.F.R. §264 (198) for a sample permit under the RCRA.

[45] Superfund Act of 1980, §9606(a).

[46] Ibid., §9607(a)(A). The dollar limits are given in §9607(c)(1):

> (A) for any vessel which carries any hazardous substances as cargo or residue, $300 per gross ton, or $5,000,000, whichever is greater;
>
> (B) for any other vessel, $300 per gross ton, or $500,000, whichever is greater;
>
> (C) for any motor vehicle, aircraft, pipeline . . . or rolling stock, $50,000,000 or such lesser amount as the President shall establish by regulation, but in no event less than $5,000.000 (or, for releases . . . into the navigable waters, $8,000,000) . . .
>
> (D) for any facility other than those specified in subparagraph (c) of this paragraph, the total of all cost of response plus $50,000,000 for any damages under the title.

[47] Ibid., §9601(24).

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least it might be possible to subject government intervention to at least two conditions: (1) Wherever practicable the government must consult with known defendants, and (2) defendants after the fact may litigate the reasonableness of government actions. These provisions may forestall some needed government action, but they also might restrain government intervention when private defendants are able to make the basic clean-up effort.

From what has been said, it is clear that the liability provisions are unnecessarily complicated. The truly confusing feature of the statute, however, is in the provisions for *direct actions* by and against the government.[48] The legislation explicitly allows individual parties who claim environmental injury to pursue two avenues of relief: An action against the asserted wrongdoer,[49] or one against the government itself.[50] Suits against the private defendant must be filed before an action against the government can be commenced. But the only precondition for that second suit (at least for releases of hazardous substances covered by the Act) is that the private claim be unresolved 60 days after that suit is filed.[51] It should be noted that the government has extensive rights to mediate the private disputes.[52] But mediation is not coercion, and if mediation fails, the government is authorized to pay damages for harms covered under the statute, obtaining in exchange a right of subrogation to recover from the private wrongdoer the money already paid out, plus all of its own additional expenses in processing the claim and in procuring the recovery.[53] The injured party may continue to press the private defendants for his compensation. His state law actions are not preempted by the statute,[54] nor is he prevented by the doctrine of collateral estoppel from relitigating issues that he has lost in his own claims against the government.[55] A successful suit against the fund only requires the plaintiff to reduce his private damage claim by the amounts already recovered from the government.[56]

[48] Ibid., §9611(b).
[49] Ibid., §9607(a).
[50] Ibid., §9611(b).
[51] Ibid., §9612(a).
[52] Ibid., §9612(b)(4).
[53] Ibid., §9612(c).
[54] Ibid., §9612(e).
[55] Ibid. Collateral estoppel (or "issue preclusion") is "[w]hen an issue of fact or law is actually litigated and determined by a valid final judgment, and the determination is essential to the judgment, the determination is conclusive in a subsequent action between the parties whether on the same or a different claim," *Restatement (Second) of Judgments,* §689 Tent. Draft No. 4, 1977.
[56] Superfund Act of 1980, §9614(b).

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The injection of the government as an interested party into virtually all environmental litigation is the most novel and the worst feature of the Act. To illustrate how unsound the idea is, I will consider first those suits in which the plaintiff claims to have identified the proper private defendants and then those in which he insists he cannot.

In the first class of suits, actions by and against the government should be barred. The case for government intervention rests upon the inability of the private parties to overcome the many factual and remedial obstacles of the private cause of action. Yet government suits contemplated by Superfund do not obviate these difficulties in the slightest, for the government must rely upon the techniques used by the supplanted private plaintiffs. It may be that individual actions will founder upon proof of identification, proof of causation, or proof of damages. So too will government suits, which are heir to all the weaknesses of private actions — not to mention the problems caused by bringing a third party into ordinary civil litigation. The government will be further removed from the relevant evidence than any of the interested parties, and it will not have any information that will better enable it to answer the questions at hand. In essence, there is an enormous cost — not to mention the manifest possibility of political abuse — of making the government a party to a set of suits in which it is an inferior litigator to the private party it supplements or replaces. These suits, with all their unneeded procedural complications, are wholly unwarranted.

The second class of cases — those in which no proper defendant can be found — are also inappropriate for government involvement. Here the apparent rationale is that every person who suffers a wrong should be entitled to some sort of remedy. This proposition, however, misstates its ethical premise. The proper rule is that each injured party should have a remedy *against his wrongdoer*. If that wrongdoer (if any) is insolvent, or cannot be identified, there is no reason to allow a remedy against an unrelated third party. The additional suit is clearly inferior to private insurance, which is available against some (but not all) of these hazards. It also dulls whatever incentive a potential victim might have to mitigate his loss. The losses of environmental harms are not different in principle from any other types of losses. There is no warrant for singling them out by statute for special treatment in the name of a government benevolence that must be funded by taxes exacted from the population at large.

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Taxation

The extensive set of taxes imposed by Superfund also should be examined. As an initial point, no objection per se is decisive against all forms of taxation of current or potential polluters. The tax in question can be justified in principle as a police power measure, where it functions as a substitute for private damage actions, which are too difficult and too costly. But to state the case for some taxation in the abstract is not to make the case for the forms of taxation imposed in this Act. It should be noted that the statute provides for tax revenues from at least three separate sources — general revenues, funds collected from shipping certain goods, and funds collected when waste materials are shipped to dumpsites for collection and storage.[57] All these taxes are supplemented by whatever revenues the government can collect from specific parties who have violated provisions in the Act.[58]

As an effort to control or influence the levels of pollution, there is no merit whatsoever to a general revenue tax, which in no way can mirror the incentives of any private set of damage actions. With the pressing problem of orphan dumpsites, however, this is not the case. If the responsible parties have, for whatever reason, escaped apprehension and detection, it does not mean that nothing should be done to clean up the abandoned, but festering, sites. Rather than being an exercise in finding individual responsibility, the problem is now how the public protects itself against sickness and disease brought on by acts of God or by insolvent third parties. In some cases individual responses may be best, but free-rider and hold-out problems could block any intelligent response. Where some collective clean-up campaign is needed, general revenues are normally the best source of revenue, at least if it can be shown that the dangers are roughly uniform over the whole population. Totaling up the net benefits of cleaning certain point sites of pollution, likely to be themselves spread across the United States, is a useless exercise. Special assessments that accurately match the costs and the benefits of clearing out the site are too impractical. The general tax does not create an obvious source of injustice, and it is simple to collect.

Taxes imposed upon goods as they are placed in the stream of commerce are, however, difficult to justify. They are inferior to general revenue taxes as a means to provide funds to clear out the orphan dumpsites, since there is no evidence whatever the parties

[57] Ibid., 26 U.S.C. §§4611-82.
[58] Ibid., 42 U.S.C. §9631(b)(1)(B)-(E).

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taxed are responsible for the designated harms. By the same token, the tax is not a good method for controlling potential sources of pollution. The tax itself is levied at the outset of the production system, while the greatest danger of release comes from the parties further down the chain of distribution, over whom the manufacturer has little or no control. Also, the tax is not even an approximate measure of the loss attributable to the products. Thus, there is no allowance made for goods that are shipped outside the United States and that cannot be expected to cause any local environmental damages. Nor is there any possible way to tie the tax level to damages via some crude product classification scheme. Care in designing the product, or in handling or disposing of it, is not considered. Far from deterring dangerous activities, these taxes, being tied to production levels, will only coerce parties who safely and efficiently handle dangerous substances to subsidize those who do not. Uniform excise taxes work best with the least interference in the primary conduct of the parties subject to the taxes. Yet some control over primary conduct is an important component of the tax system in question, making it wholly inappropriate.

Finally, there are the taxes imposed upon hazardous waste materials as they reach the dumpsite. Here, too, the case for taxing these wastes for the harms caused by the orphan sites is weak. There is little reason why one firm, which must deal with permits, insurance, inspections, and regulations, should be required to foot the bill for the cleanup of another, when the first firm is not accountable for the other's acts. The taxes might be appropriate as a substitute for future damages, but inputs are at best a crude measure of outputs. Far superior controls seem to be available from fines, which are keyed to the amounts of materials that escape the sites, either as a supplement to, or a substitute for, private damage actions.

Conclusion

The Superfund legislation, it seems clear, suffers from overambition, which blocks the way to a more modest, but more effective, government policy. Three elements are central to a sound policy.

1. The government should be allowed to maintain an action for the destruction or damage to unowned natural resources. This is designed to prevent destruction of the common pool, but requires no special powers of taxation. The returns from the successful

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suits are more than sufficient to fund the entire operation.

2. The government should operate a permit system that allows it to identify the individual defendant responsible for the release of a chemical substance into the environment. The costs of the program should be modest, since identifying the type of waste materials should not be difficult as long as it is known that something in the waste could cause damage. The fees for administering the permit system could be collected from a tax used to administer the permits.

3. The government should be given broad and immediate powers to clean up and regulate existing dumps. They present the greatest threats of large-scale pollution and the greatest obstacles to private relief, given the weaknesses of private damage actions after the fact, and the near impossibility of organizing a coalition of plaintiffs to obtain injunctive relief beforehand. Concentration on these sites makes it inappropriate to worry about the tax on inputs; it would be better to devise a system of fines and charges that could be levied against the owners or managers of the plants in question, or the parties who have abandoned them. There will be some instances in which these parties cannot be identified, and to fund those necessary cleanup operations it may be necessary to draw upon general revenues.

Back of this three-pronged system, there is still a panoply of private actions for injunctive and damage relief. With these already in place, it is best to proceed in a cautious and responsible fashion lest the proliferation of new remedial forms unduly hamper the cause of environmental protection. Private remedial actions have their theoretical weaknesses, but they are dwarfed by the weaknesses of a set of public remedies crafted by those with an unbounded faith in the wisdom of government-initiated intervention. Thus, we have been able to turn a near-complete circle. It is possible first to show that government action should not be ruled out, per se, and then show that the very arguments that justify government intervention are also sufficient to limit its scope and nature. The door for direct government control is left open as a matter of legal theory. Yet when all the returns are in, that door is not open very wide at all.

Postscript

I want to clarify my position on some of the points made by Professors Hamowy and O'Driscoll in their separate comments upon

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my paper. To do so I will organize the discussion around two separate issues: The use of government ownership as a response to the common pool problem with certain unowned resources, and the use of public licensing, either as an alternative to or supplement for the private remedies of damages and injunctions.

The Common Pool

I have argued that government ownership of common pool resources is often desirable as a means to prevent their premature consumption or destruction. Professor O'Driscoll acknowledges the problem, but then chides me for dismissing too quickly the ordinary forms of private ownership as a response to the problem. Where the principle of first possession (as the root of original title) does not lead to the dissipation of the common pool resource, as in the case of land, I agree with him completely, and did not mean to suggest otherwise. The problem is that for certain common pool resources, such as fish and game, this same principle of first possession often leads to the premature destruction of the stock, which is the source of the problem in the first place. It is impossible, for example, to capture an entire school of migratory fish and still provide them with a habitat in which they can survive and reproduce.

If first possession rules will not solve the problem, what about other private arrangements? A complex network of contracts or informal understandings surely will not do. They are difficult and cumbersome to enforce and some individuals will ignore those restrictions and step up their activities in exhaustion of the pool now that their competition has agreed to restrain itself. Professor Hamowy suggests that a set of private tort remedies be provided to the aggrieved parties, but here too, there are objections. First, within the traditional corrective justice framework, it is hard to allow a remedy to a person who cannot show the loss or destruction of his own property. The case is one of *damnum absque iniuria,* similar to competition. Second, to give fishermen actions against polluters is to solve the problem of pollution by creating a second one — overfishing. And third, it is impossible to identify which individuals count as proper plaintiffs in a tort action, none of whom are owners. Here the theoretical concerns are accurately reflected in recent litigation, *Union Oil* v. *Oppen,*[59] which allowed all fishermen who claimed commercial loss to sue Union Oil for the damage caused by its discharge of oil into the Santa Barbara channel. But

[59] 501 F.2d 588 (9th Cir. 1974).

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how can the class of proper plaintiffs be confined when, as in *Pruitt* v. *Allied Chemical Corporation,*[60] sportsfishermen, seafood wholesalers, retailers, processors, distributors, and restaurant owners sue on the same theory? One great advantage of government ownership is that it reduces the number of possible plaintiffs, sharpens litigation, and makes more credible the deterrent effect against polluters.

The question remains of the proper role of the state as owner. In my paper I noted that state ownership placed certain resources "on a par" with private ones, but (here the caveat O'Driscoll downplays is crucial) only "for the protection against their destruction by pollution," or I might have added from premature capture, as well. State ownership of certain resources does not solve the problem of how the state should exploit its resources. The evils of state power, illustrated by O'Driscoll, point very powerfully in the direction of the smallest possible role for the state. A system that transfers the rights to exploit these resources to private parties is best able to turn the resources to useful and productive ends. To argue in this way, however, is not to consign the state to a negligible role. There is still the premarket decision of how to package the rights to fish and game for transfer. Care must be taken to define the rights in terms which vary with the conditions at the time of the harvest, lest there be under- or over-utilization of the resource. There is also the question of whether some form of compensation should be made to those individuals who have previously exploited the common resource before the system of state ownership, i.e., whether a straight action or preferential grant system is desirable. And last, there is the question of whether the function of protection against outside harm should be undertaken by the state, by the licensee, or both.

The questions of implementation are difficult, and O'Driscoll is right to remind us that in some instances the cure of government management may be worse than the original disease. But that judgment can be made only after a dispassionate analysis of the benefits and costs of alternative institutional arrangements. While he is correct to condemn state ownership of western lands, some government role in the management of fisheries is required. The issue, therefore, is not how we can keep government out of the matter, but how we can design institutional arrangements that will allow it to function efficiently in a restricted area.

Licensing

Another point I made was that state licensing can in some in-

[60] 85 F.R.D. 100 (E.D. Va. 1981).

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stances be a useful supplement to private actions for damages or injunctions. Professor Hamowy, keenly aware of the enormous abuses of licensing in the past, takes a contrary position, arguing that licensing should be used "only when the harm that ensues is of such magnitude that it clearly outweighs the social damage that follows upon the enlargement of state activity." It is possible to quarrel with his precise formulation, since he does not explain why licensing is inappropriate where the social benefits simply "outweigh" the social damage. But Hamowy's more stringent test is sufficiently acceptable to make my general point. So long as one admits that some remedial balancing is required under conditions of uncertainty, it is impossible to reach a priori the conclusion that licensing is an illegitimate function of the state. The range of activities increases enormously when measured by the extent of the anticipated peril and the ability to control it by social pressures and private actions. By these tests, noise pollution between neighbors and widespread chemical pollution present very different cases. To control the former, a licensing system would have to be all-inclusive and would do little to eliminate individual disputes. Informal social pressures, combined with personal actions against major and repetitive offenders and certain types of prohibitions, e.g., against radios in public parks, seems preferable. This remedial mix, however, seems to be inappropriate to those forms of pollution damage where the harms are more serious and widespread and informal pressures less successful. Here Hamowy is correct to note that the permit system outlined in the paper is not a cure-all. It does not determine whether X chemical causes Y harm. But it does help identify the source of a chemical release, thereby making it easier to find the proper defendant with whom to litigate the causation questions, and it offers extensive *protections* to various parties by providing them a safe harbor. A party in possession knows that if he transfers them to a permitted party he is free from all further litigation, except by contract. He no longer runs the risk of a tort suit, which is otherwise possible on several grounds: Has he improperly packaged goods for further shipment; is the insolvent transferee in reality the implied agent of the transferor, or perhaps his joint venture?

The analysis of licensing in environmental cases should make us cautious of any general condemnation of its other uses. Route licenses for trucks and airlines may be unwise because of their anticompetitive effects. This should not preclude, however, licensing of vehicles for identification, or drivers for competence, notwith-

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standing Professor Hamowy's hypothetical fears.

Professor Hamowy is correct to say that anyone who wants to establish a system of licensing must set rules to govern issuance. But to say there is a problem does not mean that it is impossible to resolve it. Minimum age restrictions, basic tests for knowledge of the rules of the road, eye examinations, and even revocations for reckless or drunken driving, are easily enough administered, even if there is occasional corruption. Does anyone think all comers would be allowed on private roads? In some instances, licenses are superior to both damages and injunctions. We should not try to eliminate all licensing from the arsenal of legal controls on a priori grounds. As with common pools, we should instead work to develop theories and institutions that maximize its benefits while curbing its abuses.

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EPSTEIN'S THEORY OF ENVIRONMENTAL PROTECTION

Ronald Hamowy

Professor Epstein's paper makes much of the difficulty of collecting reliable evidence in suits involving environmental damages. This difficulty, he appears to conclude, is of such magnitude that solutions that one might not sanction in other areas of the law are necessary if one once concedes that the protection of one's environment from despoliation is as much a right of each individual in a free society as is the protection of one's property from theft. However, the premise that the evidentiary problem in environmental law is somehow *qualitatively* different than it is in other areas of law is, I think, faulty.

The level of reliability of evidence, such that it constitutes legal proof that a tort or crime has been committed, is no less difficult to establish in one area of litigation than in another. All areas of the law have struggled with this problem. In reality, it is the *predictability* of what the courts will view as reliable evidence that determines whether litigation will take place, and not whether a wrong has in fact been committed. If two people are alone in a room out of earshot of anyone else and one physically threatens the other, an assault has occurred, but it is unlikely that a criminal charge will ensue or that a civil suit will avail. The existence of this evidentiary problem does not, however, warrant recourse to substantial government intervention so that suits in tort, where harm has in fact occurred, are more likely to prove successful.

With particular respect to environmental law, Epstein wishes to minimize the evidentiary problem by sanctioning the issuing of permits to those who possess hazardous substances. He does this in order to permit the ready identification (and insure the solvency) of potential offenders — releasers of hazardous substances into the

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environment. But if the implications of this argument were carried to their logical conclusion, there is no reason why the government should not issue permits to engage in all potentially criminal or tortious activities where the offender cannot readily be recognized. Under this argument, not only should automobile drivers and gun owners be licensed — Professor Epstein explicitly defends the former — but so, for example, should building contractors using dynamite and, at the extreme, all possessors of poisons and knives. It is not self-evident that facilitating access to reliable evidence by licensing warrants these intrusions into private life.

The licensing provision does not solve the problem of attribution of the source of the harm. As Epstein notes, "many different pollutants can enter a given water system at different times and in different quantities. Some of these may prove stable and others not. The re-creation of past conditions often poses enormous challenges when the evidence is available, and insuperable obstacles when it is not." (p. 20) I cannot see how issuing licenses that permit the disposal of hazardous substances will help in tracing the level of harm contributed by any specific pollutant or in determining what harm issued from which polluter unless the licensing arrangements were so elaborate and extensive that they begin to resemble the very provisions of the Superfund bill that Epstein argues against.

It is possible that without a permit system, some individuals might suffer without being able to identify the source of the wrong or, having identified it, find that the tortfeasor is insolvent. But I would suggest that this possibility alone does not warrant the sorts of intrusions Epstein would allow by sanctioning a permit system. We would tolerate such situations when the alternative is a significant level of government intervention into social and economic life, as there doubtless would be were the possessors of all potentially hazardous substances subject to government license. It might, for example, facilitate the identification of a certain class of noise polluters to license all owners of radios and phonographs and to require them to carry sufficient insurance to cover the cost of damages should they be successfully sued by irate neighbors. It is possible that without some licensing scheme, noise pollution has increased substantially and large numbers of prospective plaintiffs have been denied access to reliable evidence with which they could successfully prosecute a suit. Admittedly, the harm that could result from the release of chemical pollutants into the environment appears to have the potential of being far more serious than the noise emanating from a neighbor's radio, but it cannot be argued that this

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kind of noise pollution is always less harmful. The noise generated in one's immediate neighborhood by powerful sound reproducing equipment can be as extensive as is that generated by factories, airplanes, building construction, street repairs, and so on. I assume that Epstein does not support the imposition of a permit system here as well. Yet the reasons for sanctioning a licensing arrangement are not dissimilar. If the law is to be consistent, the principles governing noise pollution should be the same as those operating with respect to chemical pollution.

Of course, Epstein has not argued for a comprehensive system of permits for all possible polluters. Government licensing presumably will extend only to holders of those waste materials that are known to have the potential of causing "real difficulty." Here I am at a loss. Most chemicals, in sufficient quantity, carry such a potential. Some, in minute quantities, are hazardous, but only when in contact with other, otherwise harmless, chemicals. I would question Epstein's statement that "identifying the type of waste materials [subject to permit] should not be difficult." (p. 34) The number of potentially hazardous effluents alone is staggeringly large and encompasses suspended solids, dissolved organic and inorganic compounds, plant nutrients, bacteria, and viruses. The sources of these pollutants are omnipresent in any industrial society and the harm they cause may vary from noxious odors to speeding up the corrosive process on electrical equipment to substantially shortening one's life. How extensive is this permit system to be? And, having established it, would it in fact make it simpler to identify tortfeasors? Liberal political doctrine does not sanction recourse to government intervention except in certain limited instances where no voluntary alternatives are available and then only when the harm that ensues is of such magnitude that it clearly outweighs the social damage that follows upon the enlargement of state activity. I cannot see how a government permit such as Epstein envisions contributes sufficiently to solving the problem of identifying polluters, given the mischief such a system would allow.

I also have difficulty with Professor Epstein's conclusion that the government's jurisdiction should extend to the common pool of unowned natural resources. The solution to this problem appears to lie not in surrendering control over unowned things to the government — whose primary interest does not lie in either protecting these resources or in using them most economically — but, if possible, in bringing the common pool into something approximating

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private ownership for the purposes of tort law. Epstein's argument here relies heavily on the conclusions of Sweeney, Tollison, and Willett with respect to resources having common-pool properties. However, the Sweeny-Tollison-Willett analysis does not address the question of pollution of unowned resources, but rather the problems involved in defining property rights over certain common-pool resources and in conserving these resources in the face of multiple exploiters. There is no reason why the law could not recognize any exploiter of such resources as custodian of the resources, that is, as plaintiff in a suit for damages in instances where the resources are polluted. Indeed, it would be to the advantage of all exploiters to enter into a joint action for damages if injury is provable.

The outcome of such an arrangement would clearly be more efficient than that which would obtain if the government were recognized as the exclusive trustee of common-pool resources. This is especially true since the state, in fact, cannot show damages, but can only be deemed to have suffered damage by legislation to that effect.

I assume that a solution along these lines is legally possible and that there is no inherent theoretical obstacle to allocating to individuals the right to sue in tort in such common-pool situations. If such difficulties do exist, it is unfortunate that Professor Epstein has not examined them. I cannot foresee any insurmountable theoretical difficulty arising out of solving the common-pool problem in this way, although, admittedly, tort law would have to be altered to accommodate the category of private trustee without power to sue in certain areas of trespass.

One of the major thrusts of Epstein's essay, which emerges in both his theoretical discussion and his recommendations for a workable environmental statute, concerns the best method of providing ex ante relief where large numbers of possible litigants are involved. His position is summarized in his discussion of automobile drivers. Epstein argues here that government intervention via licensing is a more efficient means of administering injunctive relief than is the court system responding to many individuals acting independently.

The benefits of this solution to the problem of large numbers appear self-evident to Epstein. He sketches out the criteria of who ought to grant injunctive relief but he offers no evidence to substantiate his claim that the benefits of granting wholesale injunctive relief through a licensing system clearly outweigh the

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problems that follow upon the creation and operation of a licensing authority. There is no acknowledgement that a licensing system requires a massive and intrusive government apparatus and that the licensing authority itself must face the question of what criteria to employ in granting or withholding licenses. What evidence is germane to determining who is to be licensed, and what correlation do the criteria for the withholding of a license have to the criteria that would lead a court to enjoin a particular driver?

Epstein's argument here suffers from a conceptual confusion. Strictly speaking, there is no permanent ex ante relief in tort. There is, at best, an increased ad hoc penalty attached to engaging in a certain activity that is, in its own right, tortious. Injunctive relief is relief only so long as the behavior is not engaged in; it does not stop the activity, but only punishes it more severely, should an enjoined defendant engage in it. More importantly, it must first be proven to the court's satisfaction that the activity would be tortious before it will issue. The remedy is available only to those complainants who can prove that the action to be enjoined is injurious.

An injunction is not a form of preventive detention, which thwarts a defendant from violating the law by restricting his movements, generally by physical confinement. Nothing prevents a person against whom a permanent injunction has issued from engaging in any act that is not tortious. He is as free to go about his daily business and to engage in all noninjurious acts as is anyone else. The denial of a license, on the other hand, *is* as blunt an instrument as is preventive detention, since, by its nature, it prohibits a large area of harmless activity to someone in order to prevent an injurious act from being committed; it thus punishes *before* a wrong has been committed, while injunctive relief does not.

The denial of a license prohibits a person from engaging in certain conduct, whether or not that conduct is tortious. The withholding of a license, unlike the granting of a permanent injunction, does not occur only in instances where it can be proved that a harm would result from a specific action of the prospective licensee; indeed, the denial of a license does not even require a complainant. Refusing to issue a license amounts to prohibiting certain individuals from engaging in a whole area of activity, tortious or not, without any evidence that its issuance would result in a specific injury. In gist, a licensing system, unlike a system of injunctive relief, limits the freedom of all those who are refused licenses not only to engage in harmful activities, but to engage in any activities falling under the purview of the particular licensing board. Even more pernicious, a

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licensing system restricts the freedom even of those awarded licenses, since in any licensing scheme, the burden of proof falls on the applicant to prove his competence, and away from the licensing authority to prove that the applicant should be denied a license. The reverse-onus provisions of licensing laws are perhaps their most offensive feature and are incompatible with any system of law that punishes only the guilty.

There is a clear legal distinction between injunctive relief and licensing, and I cannot imagine why Epstein has opted for the truncheon when the law provides something akin to a surgical knife. I cannot agree that the problem of large numbers warrants recourse to as noxious a device as licensing, either to solve the problem of highway accidents — assuming that it *has* lowered accident rates — or to provide a system by which environmental polluters can more easily be identified. Nor is it self-evident that the transaction costs generated by a licensing system are far lower than those that would be incurred under a system limited to private relief in law. Licensing is a cumbersome instrument at best and a powerful weapon for repression at worst; it deserves short shrift from legal theorists like Epstein, who are concerned with the delineation of rights in a free society or the delineation of remedies consistent with those rights.

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POLLUTION, LIBERTARIANISM, AND THE LAW

Gerald P. O'Driscoll, Jr.

Introduction

In his paper, Professor Epstein sets himself two main tasks. First, he seeks to inform libertarians of the complexities involved in applying their ethically-based legal theories. Second, he critically analyzes the Superfund legislation from the perspective of a liberal system of rights, as well as with regard to the legislative purpose of the act.

In analyzing Epstein's paper, I will first consider certain arguments in detail. I will focus in particular on certain questions raised by Epstein or implicit in his analysis. At the end of this paper, I consider more general issues. Accordingly, I begin with Epstein's section on the Superfund.

Superfund

Professor Epstein describes the Superfund legislation "as a comprehensive attack on the release of toxic substances into the general environment." (p. 22) In the preceding section he argues for treating pollution as a nuisance, and thus a tort. Accordingly, he then examines the Act and its remedies for efficaciousness in protecting the environment, as well as its consistency with a system of substantive rights. His objections to the Act are to its remedies and to government's role under the Act. His criticisms are trenchant and to the point. I will review some of them briefly.

The first major problem with the Act is its sheer breadth. This

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breadth, together with the requirement of notice to the E.P.A. of all "spills," yields a particularly obnoxious piece of legislation. As Epstein observes, the Act would require notice to the E.P.A. of a "spill" of cleaning solution on a small farm whose only effect is to damage the farmer's furniture. (p. 23) In fact, under the notice provision, the farm itself is a "facility" that must be registered with the E.P.A. as a potential pollution source.

Though Epstein is a leading advocate of strict liability, he criticizes making defendants in a pollution case jointly and strictly liable. It now is accepted in tort law that defendants are jointly liable for damages to a plaintiff, each tortfeasor or any subset of tortfeasors being liable to the full extent of assessed damages.[1] Epstein's objection is to the unwarranted extension of strict liability, which was originally a causal theory, to situations in which dozens or even hundreds of otherwise innocent parties are joined as defendants. These are individuals or firms whose only relation to each other, much less to the plaintiff, is that they occupy the same "line of commerce" as is involved in the hypothetical suit. Their causal connection to a hypothetical spill is nonexistent in any commonsense usage of "cause," and would not be recognized as causal at common law. Thus strict liability is an inappropriate rule.

At common law, joint liability of tortfeasors insures that innocent victims can recover at low cost from guilty parties, and that guilty parties do not benefit at the victims' expense (since joint tortfeasors can sue each other to apportion damage among themselves). In the Superfund legislation, the joint liability provision's ostensible purpose is to provide incentives. All parties who have control over hazardous substances at any stage of production are to have the maximum incentive to take safety precautions and otherwise to comply with the Act. As Epstein demonstrates, the joint liability provision dissipates incentives by reducing the expected cost to a polluter of his tortious acts.

At this point, one must ask of Superfund, *Cui bono?* Why Superfund? The bill cries out for the kind of dissection performed by Epstein. It is rife with evident problems. Is Superfund another case of inept legislation to solve a pressing social problem?

I think not. Superfund not only spreads the cost of polluting across parties, thus dissipating incentive effects of fines, but it also

[1]Charles Gregory, Harry Kalven, Jr., and Richard Epstein, *Cases and Materials on Torts,* 3d ed. (Boston: Little, Brown & Co., 1977) pp. 441-445; William L. Prosser, *Handbook of the Law of Torts,* 4th ed. (St. Paul, Minn.: West Publishing Co., 1971), pp. 291-323.

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effectively socializes those costs. The tax provisions for funding expenditures to clean up environmental damage quite obviously socialize the costs of that damage. Epstein finds a tax solution to be relatively innocuous. I think his attitude may stem from a failure to consider what may be the larger purpose of the Act. The tax provision may be the most obvious piece of evidence for my thesis, but it is probably not the most important one.

In essence if not in contemplation of law, the government has been made a joint tortfeasor to every private suit under Superfund. Thus the taxpayers of the U.S. are jointly and severally liable for every tort actionable under Superfund (certain conditions having been met, as explained in Epstein. Acting, in effect, as agents of taxpayers, relevant government officials can sue private defendants to recover all damages and costs assessed against or incurred by the government. Taxpayers would be wise to derive little comfort from this prospect, for the incentive structure is all wrong. Private parties protect their interests because they personally stand to lose from their inaction or ineptitude. The relevant government officials have little or nothing to lose directly from less than vigorous enforcement of judgments against polluters for whose actions taxpayers have borne the damages. Evidence for this property rights thesis abounds at all layers of government for a wide variety of cases. Some of these are explained below.

The analytic point is that because of the property rights structure, government officials are notoriously deficient as "agents" of taxpayers. This deficiency in the agency relationship (which is at best an analogy) means that the ability of plaintiffs to sue the government for damages inflicted by other private parties makes Superfund a mechanism for distributing harm over the taxpaying population.

The role of government in the Act goes to the heart of the pollution question, because it brings the property rights issue to the fore. Epstein has surprisingly little to say concerning the property rights issue, and what he does say is misleadingly incomplete.

The Property Rights Issue

In several instances, Epstein asserts the necessity of some government regulation or public policy toward the environment. In the introduction, he suggests that there is a distinction between regulation of prices and wages and environmental regulation. He avers that, "The elimination of all government controls [of the environ-

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ment] seems quite unthinkable." (p. 9) He argues that there are complexities involved in applying simple legal principles to complex situations like highway accidents. At the end of this argument, he concludes: "There is no clear-cut argument for putting all remedies in private hands." (p. 17) In a footnote to that conclusion, Epstein briefly considers adopting a system of private highways and urban roads. He states, "It is difficult to believe that this system would continue to command popular support; today the problems of converting from a public to a private system are quite insuperable." After very quickly touching on remedies with a purely private system of roads, he concludes that "even under an ideal system of property rights" it would not be feasible to rely only on private causes of action. (n. 12)

These scattered references aside, Epstein basically avoids any property rights analyses of the environment. When he takes cognizance of the property rights approach, he seemingly misses the point. First he argues (correctly) as follows:

> There is a well-documented body of literature that indicates that a system of common law rights and remedies fails most completely in the protection of unowned things. The great danger is that such things will be either destroyed or captured so rapidly as to not take into account the long-term consequences of individual actions. (p. 24)

At this point Epstein advocates the following solution to the common-pool problem:

> To remedy this premature exhaustion of the common pool, it is necessary to put someone in the position of an owner . . . . the state, as representative of all individuals, is better able to fulfill that function than any other single individual or group of private individuals. . . . unowned things are placed on a par with those that are owned in their protection against destruction by pollution. (pp. 24-5)

Epstein's analyses is faulty in several respects. First, his argument proves too much. If one accepted it, one would conclude that all resources ought to be owned by the state. Second, the most straightforward resolution of the common-pool problem is to turn the commons into privately owned resources. Having eliminated the most obvious (and best) option, Epstein is left with the state. It is simply not true, however, that state control puts "unowned" or commonly held resources "on a par" with privately-owned resources. Governmentally controlled resources are generally depleted at a *different* rate than either resources privately owned or

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those held in common.[2] The depletion rate for resources under government control depends on a host of political factors. Consider the following three cases.

First, a governent official (perhaps a ranger in a national park) is free to maximize his *utility* in the use of a resource. The official will want to maximize the *average product* or average return in using the resource (however output is defined). Some use by the public may be permitted,[3] but the public will *not* have free access to "its" resources. In this case, the common-pool problem — the problem of overutilized resources — is "solved" by underutilizing resources.[4] The reason the resource will be underutilized is that the (honest) official cannot appropriate payments from others for further exploitation of the resource. The official cannot then take account of market "signals," sent by the public, revealing the urgency of their preferences for resource utilization. In economists' terminology, the official will not internalize the benefits to others of using the resource.

In the second and third cases, the official faces additional constraints in the form of interest-group pressure. In one case, we have the developer who wants a quick "rape of the land." The alternative case is the extreme environmentalist who wants no use of the resource (unless "use" encompasses passive contemplation of perpetually untouched virgin resources). At one extreme, there would be the most rapid feasible depletion or capture of the resource. At the other extreme, no resource use whatever. The real-world political situation typically is an outcome of the balancing of such forces. If the developer has his druthers politically, resources may be used up *faster* than in the common-pool case. This can be shown once we recognize a glaring omission in most economic analyses of the common-pool problem.

Economic analysis traditionally ignores nonmarket private institutions. Recent interest in common law is belated recognition of the importance of one type of private nonmarket institution. Family, neighbors, clubs, and social organizations of all types exist to restrain individuals from unbridled pursuit of their interests at

[2] Charles Baird, *Prices and Markets: Microeconomics* (St. Paul, Minn.: West Publishing Co., 1975), pp. 63-66.

[3] The official will permit some use by others only if there is a range of increasing returns to scale. In this range, more use by others leads to *more* of the resources being available to the official.

[4] Optimum use of a resource requires that it be exploited up to the point where *marginal* benefits and *marginal* costs are equal. Maximization of *average* product will result in underutilization.

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the expense of others. The absence of markets complicates marginal adjustments to changing circumstances.[5] But the absence of organized markets is less significant than state power being brought to bear on behalf of private interests. State coercion is often (though not always) capable of overcoming moral restraints of family, clan, and church.[6] The "holdout" can spurn the monetary blandishments of the wealthy developer, but cannot resist the same developer armed with state power in the guise of eminent domain.

We can easily see the results of government stewardship over natural resources. Upwards of 90 percent or more Western land is held back from virtually any economic use by federal authorities. At the same time, the Agriculture Department has permitted logging companies to "clear cut" groves in national forests. This seeming inconsistency in policy is irrational only if one persists in thinking that government control of national resources is intended to put them "on a par" with privately owned resources.

There is no government solution to pollution or to the common-pool problem because government is the problem. I will consider three cases adduced by Epstein to illustrate this contention.

First, there is the complex problem of "dumping." Many of the complexities, however, involve the multifaceted ways in which the state intervenes and affects markets and property rights. The first point to note about "phantom dumpers" is that they prefer public land (including rivers and streams) because their expected cost is lower than for dumping on private land. By the same property rights argument outlined above, we expect private landowners to be more protective of their rights. Public authorities are comparatively lax in protection of the public's land. Thus, the federal government has never acted, under authority going back to an 1899 act, to protect rivers and streams from pollution.

"Orphan dumpsites" are often on private land. Their existence, with contaminant toxic spills and leaks, is testimony of the failure of another governmental institution — zoning. At minimum, zoning, if it is to be justified at all, should protect us against nuisances generated by illegal uses of land sites. Could a system of private covenants and common-law nuisance remedies work any worse than zoning to protect us? It must also be emphasized that corrup-

[5] Markets are not, however, the only private mechanism for controlling behavior at the margin. As Thomas Sowell has pointed out, "informal relationships" of all kinds are important social organisms accomplishing this purpose. Thomas Sowell, *Knowledge and Decisions* (New York: Basic Books, 1980), pp. 23-30; 91-92.

[6] Robert Nisbet, *Twilight of Authority* (New York: Oxford University Press, 1975).

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tion plays a key role in the dumping problem. The link between organized crime and the state is an essential element of the orphan dumpsite issue. Storage and dumping of toxic chemicals has become a lucrative economic speciality of organized crime. Already existing regulations and laws make it too costly for honest firms to dispose legally of these wastes. This leaves the business open only to illegal and quasi-legal devices. (The analogy to the cases of gambling and high-risk loans is clear.) Government officials, by setting unreasonable rules, produce the corruption and results they and the public deplore.

Second, there is the common pool problem. Epstein is certainly accurate in observing that common law fails in dealing with unowned goods. This is no accident, for common law is preeminently the law governing and protecting private rights and interests. It is thus imperative in a free society built on common law foundations that resources held in common be converted to private use. From mining claims[7] to radio waves,[8] the Anglo-American common law has been adept at absorbing and recognizing new ownership forms. Markets have arisen rapidly in the wake of legal recognition and sanction of private rights. Unless inhibited or prevented, individuals will establish private property claims to valuable but heretofore unowned resources. The common pool exists because the state prevents individuals from privatizing the commons. To seek remedy in further state regulation is to confuse the solution with the problem.

The third issue is that of roads. As to private highways, there can be no serious contention. The widespread existence of public toll roads negates any serious allocational argument against private toll roads. The economic problems of developing an extensive private highway system could be no greater than they were for developing an extensive private railroad system. And, of course, today we have a public highway system in place. Urban roads present somewhat greater conceptual and practical problems, but those difficulties are not really those raised by Epstein. Any rational urban road system would involve neighborhood covenants. It is not clear that traffic restrictions under these covenants would necessarily differ from what exist to some extent today. For example, one could envision restrictions on commercial traffic passing through residential

[7]Gary Libecap, "Economic Variables and the Development of the Law: The Case of Western Mineral Rights," *Journal of Economic History* 38 (1978): 338-62.
[8]Ronald Coase, "The Federal Communications Commission," *Journal of Law and Economics* 2 (1959): 1-40.

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neighborhoods unless the traffic involved delivery of goods to that neighborhood. (This particular restriction is in widespread use today.) In general, developers and neighborhood organizations would internalize benefits and costs to others of alternative uses of neighborhood roads. The obstacle to a private road system is municipal ownership and zoning, not a hypothetical inability of individuals to respond to market signals.

In each of these three cases, a statutory or regulatory remedy would appear to be a viable solution to a social or economic problem only if one were to start with the situation as it exists now, unmindful of the causes and origins of that problem. In each case, prior state action was a significant contributor to, if not creator of, the problem in the first place. This insight naturally leads us to Epstein's initial argument.

The Libertarians

Epstein appeals to libertarians to consider both the complexities of legal issues and "popular sentiment." His task is to "examine the strengths and limitations of a corrective justice [i.e., libertarian] theory in its application to concrete legal and social problems." (p. 10) Epstein's stated endeavor is an extremely important one. I sympathized and generally agreed with his gentle chiding of libertarians for overlooking the practical problems involved in implementing libertarian legal principles. Questions of evidence, uncertainty, and remedy have been slighted by libertarian legal theorists. No one is more qualified or better suited to bring these points home to libertarians than Richard Epstein. One would hope that such an effort by him would begin a dialogue, which would sharpen libertarians' awareness of legal issues and legal problems. This process would be inestimably helpful in their bringing their insights to bear on law.

My problem with Epstein's goal lies not in its conception but in its execution. I think Epstein has really written two papers, or rather, one fairly complete paper on Superfund and one incomplete paper on libertarianism and law. My suggestions, criticisms and emendations aside, I found Epstein's dissection of the Superfund legislation to be very good indeed. His "general theme" seems, however, to have been lost somewhere between the middle and the end of his paper. The Superfund legislation does not illustrate some failure of libertarian analysis to come to grips with environmental issues. Superfund is a statutory nightmare, designed to deal with difficult

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problems rendered intractable by prior government intervention. What Epstein details is not a failure of libertarianism but of statute, not a weakness in common law so much as the impotency of statutory solutions. In fact, Epstein all but says this in his final paragraph.

If I could identify one theoretical point on which I think Epstein goes wrong it is the "large numbers" case. In that discussion, he essentially rediscovers the high transactions-cost problem in the Coase theorem. Epstein's high transactions-cost examples are either caused by or exacerbated by state action. Some problems (e.g., urban noise pollution) really are more or less insoluble under present technological conditions.[9] But transactions-cost arguments must be examined in light of relevant market alternatives. Political reality certainty ought not to intrude into analysis in the first round.[10] In examining the large-numbers issue, one must keep in mind that a system of well-specified private property rights is the preeminent way to solve the problem. Consider the externality problems that would exist were food grown on land held in common (to cite a concrete rather than a hypothetical possibility). Recognition of private claims to resources diminishes if it does not eliminate the externality or large-numbers problem. Common law in a liberal system of rights not only provides the legal framework for, but also "fills in the gaps" in a market system. We do not need to bore wider holes in the social system through which activist governments can intrude into private matters.

Environmental policy is a complex issue, made more so by government failure. Libertarians have much to learn about the law. But environmental policy has been heavily mined by economists, and well thought out by some libertarians. As Professor Epstein demonstrates, libertarians are capable of addressing the issue without resorting to unpalatable tools.

[9] I stress the proviso about technology. Technological innovations have a habit of rendering obsolete economists' examples of externalities. This runs counter to environmental thinking, which sees technology as the source of environmental damage.

[10] For instance, Epstein worries about public acceptance of private roads. It is surely not the scholar's task to worry about public acceptance today of a reform proposal for the future. Good reform proposals help make their acceptance possible by changing public opinion. In this sense, public opinion is an endogenous, not an exogenous variable. Ten years ago, who would have been sanguine about deregulation of surface and air transport, or elimination of resale price maintenance law? Five years ago, who would have expected a return to a gold standard to be seriously entertained?

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LAW, PROPERTY RIGHTS, AND AIR POLLUTION

Murray N. Rothbard

Introduction: Law as a Normative Discipline

Law is a set of commands; the principles of tort or criminal law, which we shall be dealing with, are negative commands or prohibitions, on the order of "thou shalt not" do actions, X, Y, or Z.[1] In short, certain actions are considered wrong to such a degree that it is considered appropriate to use the sanctions of violence (since law is the social embodiment of violence) to combat, defend against, and punish the transgressors.

There are many actions against which it is not considered appropriate to use violence, individual or organized. Mere lying (i.e., where contracts to transfer property titles are not broken), treachery, base ingratitude, being nasty to one's friends or associates, or not showing up for appointments, are generally considered wrong, but few think of using violence to enjoin or combat them. Other sanctions — such as refusing to see the person or have dealings with him, putting him in Coventry, etc. — may be used by individuals or groups, but using the violence of the law to prohibit such actions is considered excessive and inappropriate.

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[1] Legal principles setting down certain prohibited actions as torts or crimes are to be distinguished from statutes or administrative edicts that lay down positive demands, such as "thou shalt pay X amount of taxes" or "thou shalt report for induction on such and such a date." In a sense, of course, *all* commands can be phrased in such a way as to appear negative, such as "thou shalt not refuse to pay X amount of taxes," or "thou shalt not disobey the order to appear for induction." Why such rephrasing would be inappropriate will be discussed below. See below also for a discussion of "torts" vis-à-vis "crimes."

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If ethics is a normative discipline that identifies and classifies certain sets of actions as good or evil, right or wrong, then tort or criminal law is a subset of ethics identifying certain actions as appropriate for using violence against them. The law says that action X *should* be illegal, and therefore *should* be combatted by the violence of the law. The law is a set of "ought" or normative propositions.

Many writers and jurists have claimed the law is a value-free, "positive" discipline. Of course it is possible to simply list, classify and analyze existing law without going further into saying what the law should or should not be.[2] But that sort of jurist is not fulfilling his essential task. Since the law is ultimately a set of normative commands, the true jurist or legal philosopher has not completed his task until he sets forth what the law should be, difficult though that might be. If he does not, then he necessarily abdicates his task in favor of individuals or groups untrained in legal principles, who may lay down their commands by sheer fiat and arbitrary caprice.

Thus, the Austinian jurists proclaim that the king, or sovereign, is supposed to lay down the law, and the law is purely a set of commands emanating from his will. But then the question arises: On what principles does or should the king operate?[3] Is it ever possible to say that the king is issuing a "bad" or "improper" decree? Once the jurist admits that, he is going beyond arbitrary will to begin to frame a set of normative principles that should be guiding the sovereign. And then he is back to normative law.

Modern variants of positive legal theory state that the law should be what the legislators say it is. But what principles are to guide the legislators? And if we say that the legislators should be the spokesmen for their constituents, then we simply push the problem one step back, and ask: What principles are supposed to guide the voters? Or is the law, and therefore everyone's freedom of action, to be ruled by the arbitrary caprice of millions rather than of one man or a few?[4]

[2] Ronald Dworkin, however, has pointed out that even positive legal analysis necessarily involves moral questions and moral standards. Dworkin, *Taking Rights Seriously* (Cambridge: Harvard University Press, 1977), chaps. 2, 3, 12, 13. Also see Charles Fried, "The Law of Change: The Cunning of Reason in Moral and Legal History," *Journal of Legal Studies,* March 1980, p. 340.

[3] The Austinians, of course, are also smuggling in a normative axiom into their positive theory: The law should be what the king says it is. This axiom is unanalyzed and ungrounded in any set of ethical principles.

[4] Again, these modern, democratic variants of positive legal theory smuggle in the unsupported normative axiom that statutes should be laid down by whatever the legislators or the voters wish to do.

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Even the older concept that the law should be determined by tribal or common-law judges, who are merely interpreting the custom of the tribe or society, cannot escape normative judgments basic to the theory. *Why* must the rules of custom be obeyed? If tribal custom requires the murder of all people over six feet tall, must this custom be obeyed regardless? Why cannot reason lay down a set of principles to challenge and overthrow mere custom and tradition? Similarly, why may it not be used to overthrow mere arbitrary caprice by king or public?

As we shall see, tort or criminal law is a set of prohibitions against the invasion of, or aggression against, private property rights; that is, spheres of freedom of action by each individual. But if that is the case, then the implication of the command, "Thou shall not interfere with A's property right," is that A's property right is just and therefore should not be invaded. Legal prohibitions, therefore, far from being in some sense value-free, actually imply a set of theories about justice, in particular the just allocation of property rights and property titles. "Justice" is nothing if not a normative concept.

In recent years, however, jurists and "Chicago School" economists have attempted to develop theories of value-free property rights, rights defined and protected not on the basis of ethical norms such as justice but of some form of "social efficiency." In one such variant, Ronald Coase and Harold Demsetz have asserted that "it doesn't make any difference" how property rights are allocated in cases of conflicting interests, provided that some property rights are assigned to *someone* and then defended. In his famous example, Coase discusses a railroad locomotive's blighting of nearby farms and orchards. To Coase and Demsetz, this damage of a farmer's crops by the railroad is an "externality" which should, according to the tenets of social efficiency, be internalized. But to these economists, it doesn't make any difference which of two possible courses of action one adopts. Either one says that the farmer has a property right in his orchard; therefore the railroad should have to pay damages for his loss, and the farmer should be able to enjoin the railroad's invasive actions. *Or* the railroad has the right to spew forth smoke wherever it wishes, and if the farmer wishes to stop the smoke, he must pay the railroad to install a smoke abatement device. It does not matter, from the point of view of expenditure of productive resources, which route is taken.

For example, suppose the railroad commits $100,000 worth of damage, and in Case 1, this action is held to invade the farmer's property. In that case, the railroad must pay $100,000 to the farmer or else invest in a smoke abatement device, whichever is cheaper.

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But in Case 2, where the railroad has the property right to emit the smoke, the farmer would have to pay the railroad up to $100,000 to stop damaging his farm. If the smoke device costs less than $100,000, say $80,000, then the device will be installed regardless of who was assigned the property right. In Case 1, the railroad will spend $80,000 on the device rather than have to pay $100,000 to the farmer; in Case 2 the farmer will be willing to pay the railroad $80,000 and up to $100,000 to install the device. If, on the other hand, the smoke device costs more than $100,000, say $120,000, then the device will not be installed anyway, regardless of which route is taken. In Case 1, the railroad will keep pouring out smoke and keep paying the farmer damages of $100,000 rather than spend $120,000 on the device; in Case 2, it will not pay the farmer to bribe the railroad $120,000 for the device, since this is more of a loss to him than the $100,000 damage. Therefore, regardless of how property rights are assigned — according to Coase and Demsetz — the allocation of resources will be the same. The difference between the two is only a matter of "distribution," that is, of income or wealth.[5]

There are many problems with this theory. First, income and wealth are important *to the parties involved,* although they might not be to uninvolved economists. It makes a great deal of difference to both of them who has to pay whom. Second, this thesis works only if we deliberately ignore psychological factors. Costs are not only monetary. The farmer might well have an attachment to the orchard far beyond the monetary damage. Therefore, the orchard might be worth far more to him than the $100,000 in damages, so that it might take $1 million to compensate him for the full loss. But then the supposed indifference totally breaks down. In Case 1, the farmer will not be content to accept a mere $100,000 in damages. He will take out an injunction against any further aggression against his property, and even if the law allows bargaining between the parties themselves to remove the injunction, he will insist on over $1 million from the railroad, which the railroad will not be willing to pay.[6] Conversely, in Case 2, there is not likely to be a way for the farmer to raise the $1 million needed to stop the smoke invasion of the orchard.

The love of the farmer for his orchard is part of a larger difficulty for the Coase-Demsetz doctrine: Costs are purely subjective and not

[5]See the article launching this analysis by Ronald H. Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (October 1960): 10. For a critique, see Walter Block, "Coase and Demsetz on Private Property Rights," *Journal of Libertarian Studies,* Spring 1977, pp. 111-115.

[6]It is now illegal to bargain one's way out of an injunction by dealing with the

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measurable in monetary terms. Coase and Demsetz have a proviso in their indifference thesis that all "transaction costs" be zero. If they are not, then they advocate allocating the property rights to whichever route entails minimum social transaction costs. But once we understand that costs are subjective to each individual and therefore unmeasurable, we see that costs cannot be added up. But if all costs, including transaction costs, cannot be added, then there is no such thing as "social transaction costs," and they cannot be compared in Cases 1 or 2, or, indeed, in any other situation.[7]

Another serious problem with the Coase-Demsetz approach is that pretending to be value-free, they in reality import the ethical norm of "efficiency," and assert that property rights should be assigned on the basis of such efficiency. But even if the concept of social efficiency were meaningful, they don't answer the questions of why efficiency should be the overriding consideration in establishing legal principles or why externalities should be internalized above all other considerations. We are now out of *Wertfreiheit* and back to unexamined ethical questions.[8, 9]

Another attempt by Chicago School economists to make legal public policy recommendations under the guise of *Wertfreiheit* is the contention that over the years common-law judges will always arrive at the socially efficient allocation of property rights and tort liabilities. Demsetz stresses rights that will minimize social transaction costs; Richard Posner stresses maximization of "social wealth." All this adds an unwarranted historical determinism,

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injured party. In that case, of course, Coase-Demsetz cost internalization totally breaks down. But even with bargaining allowed, it would probably break down. Moreover, there may well be farmers so attached to their orchards that *no price* would compensate them, in which case the injunction would be absolute, and no Coase-Demsetz bargaining could remove it. On allowing bargaining to remove injunctions, see Barton H. Thompson, Jr., "Injunction Negotiations: An Economic, Moral and Legal Analysis," *Stanford Law Review* 27 (July 1975): 1563-1595.

[7] On the impermissibility of the social cost concept and its application here, see Mario J. Rizzo, "Uncertainty, Subjectivity, and the Economic Analysis of Law," and Murray N. Rothbard, "Comment: the Myth of Efficiency," in M. Rizzo, ed., *Time, Uncertainty, and Disequilibrium: Exploration of Austrian Themes* (Lexington, Mass.: Lexington Books, 1979), pp. 71-95. Also see John B. Egger, "Comment: Efficiency is not a Substitute for Ethics," in ibid., pp. 117-125.

[8] Social efficiency is a meaningless concept because efficiency is how effectively one employs means to reach given ends. But with more than one individual, who determines the ends toward which the means are to be employed? The ends of different individuals are bound to conflict, making any added or weighted concept of social efficiency absurd. For more on this, see Rothbard, "Myth of Efficiency," p. 90.

[9] Charles Fried has pointed out that efficiency is, willy-nilly, an attempted moral criterion, albeit unexamined, wrong, and incoherent. Fried, "The Law of Change," p. 341.

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functioning as a kind of invisible hand guiding judges to the current Chicago School path, to the other fallacies examined above.[10]

If the law is a set of normative principles, it follows that whatever positive or customary law has emerged cannot simply be recorded and blindly followed. All such law must be subject to a thorough critique grounded on such principles. Then, if there are discrepancies between actual law and just principles, as there almost always are, steps must be taken to make the law conform with correct legal principles.

Physical Invasion

The normative principle I am suggesting for the law is simply this: No action should be considered illicit or illegal unless it invades, aggresses against, the person or just property of another. Only invasive actions should be declared illegal, and combatted with the full powers of the law. The invasion must be concrete and physical. There are degrees of seriousness of such invasion, and hence, different proper degrees of restitution or punishment. "Burglary," simple invasion of property for purposes of theft, is less serious than "robbery," where armed force is likely to be used against the victim. In this paper, however, we are not concerned with the questions of degrees of invasion or punishment, but simply with invasion *per se.*

If no man may invade another person's "just" property, what is our criterion of justice to be?[11] There is no space here to elaborate on a theory of justice in property titles. Suffice it to say that the basic axiom of libertarian political theory holds that every man is a self-owner, having absolute jurisdiction over his own body. In effect, this means that no one else may justly invade, or aggress against, another's person. It follows then that each person justly

[10]The concept of social wealth suffers from the same disabilities as Coase-Demsetz, as well as other problems of its own. For devastating critiques of Posner, see Ronald M. Dworkin, "Is Wealth a Value?" and Richard A. Epstein, "The Static Conception of the Common Law," in *Journal of Legal Studies,* March 1980, pp. 191-226, 253-276. Also see Anthony J. Kronman, "Wealth Maximization as a Normative Principle"; Mario J. Rizzo, "Law Amid Flux: The Economics of Negligence and Strict Liability in Tort"; Fried, "The Law of Change"; and Gerald P. O'Driscoll, Jr., "Justice, Efficiency, and the Economic Analysis of Law: A Comment on Fried," in ibid., pp. 227-242, 291-318, 335-354, 355-366.

[11]The qualification of property being "just" must be made. Suppose, for example, that A steals B's watch and that several months later, B apprehends A and grabs the watch back. If A should prosecute B for theft of "his" watch, it would be an overriding defense on B's part that the watch was not really and justly A's because he had previously stolen it from B.

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owns whatever previously unowned resources he appropriates or "mixes his labor with." From these twin axioms — self-ownership and "homesteading" — stem the justification for the entire system of property rights titles in a free market society. This system establishes the right of every man to his own person, the right of donation, of bequest (and, concomitantly, the right to receive the bequest or inheritance), and the right of contractual exchange of property titles.[12]

Legal and political theory has committed much mischief by failing to pinpoint physical invasion as the only human action that should be illegal and that justifies the use of physical violence to combat it. The vague concept of "harm" is substituted for the precise one of physical violence.[13] Consider the following two examples. Jim is courting Susan and is just about to win her hand in marriage, when suddenly Bob appears on the scene and wins her away. Surely Bob has done great "harm" to Jim. Once a nonphysical-invasion sense of harm is adopted, almost any outlaw act might be justified. Should Jim be able to "enjoin" Bob's very existence?[14]

Similarly, A is a successful seller of razor blades. But then B comes along and sells a better blade, teflon-coated to prevent shaving cuts. The value of A's property is greatly affected. Should he be able to collect damages from B, or, better yet, to enjoin B's sale of a better blade? The correct answer is not that consumers would be hurt if they were forced to buy the inferior blade, although that is

[12]For more on this libertarian, or "neo-Lockean," view, see Murry N. Rothbard, "Justice and Property Rights," in S. Blumenfeld, ed., *Property in a Humane Economy* (LaSalle, Ill.: Open Court, 1974), pp. 101-122. In a sense, Percy B. Lehning is right when he comments that rather than being two independent axioms, the homesteading principle really follows from the single axiom of self-ownership. Lehning, "Property Rights, Justice and the Welfare State," *Acta Politica* 15 (Rotterdam, 1980): 323, 352.

[13]Thus, John Stuart Mill calls for complete freedom of individual action "without impediment from our fellow-creatures, so long as what we do does not harm them . . ." Mill, "On Liberty," in *Utilitarianism, Liberty, and Representative Government* (New York, E.P. Dutton, 1944), p. 175. Hayek, after properly defining freedom as the absence of coercion, unfortunately fails to define coercion as physical invasion and thereby permits and justifies a wide range of government interference with property rights. See Murray N. Rothbard, "F.A. Hayek and the Concept of Coercion," *Ordo* 31 (Stuttgart, 1980): 43-50.

[14]Robert Nozick appears to justify the outlawry of all voluntary exchanges that he terms "nonproductive," which he essentially defines as a situation where A would be better off if B did not exist. But here, of course, Jim would be far better off if Bob had not existed. For a critique of Nozick on this point, see Murry N. Rothbard, "Robert Nozick and the Immaculate Conception of the State," *Journal of Libertarian Studies,* Winter 1977, pp. 52ff.

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surely the case. Rather, no one has the right to legally prevent or retaliate against "harms" to his property unless it is an act of physical invasion. Everyone has the right to have the physical integrity of his property inviolate; no one has the right to protect the value of his property, for that value is purely the reflection of what people are willing to pay for it. That willingness solely depends on how *they* decide to use their money. No one can have a right to someone else's money, unless that other person had previously contracted to transfer it to him.

In the law of torts, "harm" is generally treated as physical invasion of person or property. The outlawing of defamation (libel and slander) has always been a glaring anomaly in tort law. Words and opinions are not physical invasions. Analogous to the loss of property *value* from a better product or a shift in consumer demand, no one has a property right in his "reputation." Reputation is strictly a function of the subjective opinions of other minds, and they have the absolute right to their own opinions whatever they may be. Hence, outlawing defamation is itself a gross invasion of the defamer's right of freedom of speech, which is a subset of his property right in his own person.[15]

An even broader assault on freedom of speech is the modern Warren-Brandeis-inspired tort of invasion of the alleged right of "privacy," which outlaws free speech and acts using one's own property that are not even false or "malicious."[16]

In the law of torts, "harm" is generally treated as physical invasion of person or property and usually requires payment of damages for "emotional" harm if and only if that harm is a consequence of physical invasion. Thus, within the standard law of *trespass* — an invasion of person or property — "battery" is the actual invasion of someone else's body, while "assault" is the creation by one person in another of a fear, or apprehension, of battery.[17]

[15] We may therefore hail the "absolutist" position of Mr. Justice Black in calling for the elimination of the law of defamation. The difference is that Black advocated an absolutist stand on the First Amendment because it is a part of the Constitution, whereas we advocate it because the First Amendment embodies a basic part of the libertarian creed. On the significant weakening of the law of defamation in the last two decades, see Richard A. Epstein, Charles O. Gregory, and Harry Kalven, Jr., *Cases and Materials on Torts,* 3rd ed. (Boston: Little, Brown & Co., 1977), pp. 977-1129 (hereafter cited as Epstein, *Cases on Torts*).

[16] There should be no assertion of a right to privacy that cannot be subsumed under protection of property rights of guarding against breach of contract. On privacy, see Epstein, *Cases on Torts,* pp. 1131-1190.

[17] "Apprehension" of an imminent battery is a more appropriate term then "fear," since it stresses the awareness of a coming battery and of the action causing that

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To be a tortious assault and therefore subject to legal action, tort law wisely requires the threat to be near and imminent. Mere insults and violent words, vague future threats, or simple possession of a weapon cannot constitute an assault;[18] there must be accompanying overt action to give rise to the apprehension of an imminent physical battery.[19] Or, to put it another way, there must be a concrete threat of an imminent battery before the prospective victim may legitimately use force and violence to defend himself.

Physical invasion or molestation need not be actually "harmful" or inflict severe damage in order to constitute a tort. The courts properly have held that such acts as spitting in someone's face or ripping off someone's hat are batteries. Chief Justice Holt's words in 1704 still seem to apply: "The least touching of another in anger is a battery." While the actual damage may not be substantial, in a profound sense we may conclude that the victim's person was molested, was *interfered with,* by the physical aggression against him, and that hence these seemingly minor actions have become legal wrongs.[20]

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awareness by the aggressor, rather than the subjective psychological state of the victim. Thus, Dean Prosser: "Apprehension is not the same thing as fear, and the plaintiff is not deprived of his action merely because he is too courageous to be frightened or intimidated." William L. Prosser, *Handbook of the Law of Torts,* 4th ed. (St. Paul, Minn.: West Publishing Co., 1971), p. 39.

[18] It is unfortunate that starting about 1930, the courts have succumbed to the creation of a brand new tort, "intentional infliction of mental disturbance by extreme and outrageous conduct." It is clear that freedom of speech and person should allow verbal insult, outrageous though it may be; furthermore, there is no cogent criterion to demarcate mere verbal abuse from the "outrageous" variety. Judge Magruder's statement is highly sensible: "Against a large part of the frictions and irritations and clashing of temperaments incident to participation in community life, a certain toughening of the mental hide is a better protection than the law could ever be." Magruder, "Mental and Emotional Disturbance in the Law of Torts," *Harvard Law Review* 40 (1936): 1033, 1035; cited in Prosser, *Law of Torts,* p. 51. Also see ibid., pp. 49-62; Epstein, *Cases on Torts,* pp. 933-952.

In general, we must look with great suspicion on any creation of new torts that are not merely applications of old tort principles to new technologies. There is nothing new or modern about verbal abuse.

It seems that both the infliction-of-harm and the new invasion-of-privacy tort are part and parcel of the 20th-century tendency to dilute the rights of the defendant in favor of excessive cossetting of the plaintiff — a systemic discrimination that has taken place in tort rather than criminal proceedings. See Epstein, "Static Conception," pp. 253-275. See also below.

[19] Prosser, *Law of Torts,* pp. 39-40.

[20] Hence, the wisdom of the court's decision in *South Brilliant Coal Co.* v. *Williams:* "If Gibbs kicked plaintiff with his foot, it cannot be said as a matter of law that there was no physical injury to him. In a legal sense, it was a physical injury, though it may have caused no physical suffering, and though the sensation resulting therefrom may have lasted but for a moment." *South Brilliant Coal Co.* v. *Williams,* 206

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Initiation of an Overt Act: Strict Liability

If only a physical invasion of person or property constitutes an illicit act or tort, then it becomes important to demarcate *when* a person may act as if such a physical invasion is about to take place. Libertarian legal theory holds that A may not use force against B except in self-defense, that is, unless B is initiating force against A. But when is A's force against B legitimate self-defense, and when is it *itself* illegitimate and tortious aggression against B? To answer this question, we must consider what kind of tort liability theory we are prepared to adopt.

Suppose, for example, that Smith sees Jones frowning in his direction across the street, and that Smith has an abnormal fear of being frowned at. Convinced that Jones is about to shoot him, he therefore pulls a gun and shoots Jones in what he is sure is self-defense. Jones presses a charge of assault and battery against Smith. Was Smith an aggressor and therefore should he be liable? One theory of liability — the orthodox "reasonable man" or "reasonable conduct" or "negligence" theory — says he should, because frowning would not rouse the apprehension of imminent attack in a "reasonable man." A competing theory, once held and now being revived — that of "strict liability" or "strict causal liability" — agrees because it should be clear to a judge or jury that Jones was *not* an imminent aggressor. And this would hold regardless of how sincere Smith was in his fear of attack.

Two serious flaws in the "reasonable man" theory are that the definition of "reasonable" is vague and subjective, and that guilty aggressors go unpunished, while their victims remain uncompensated. In this particular case, the two theories happen to coincide, but in many other cases they do not. Take, for example, the case of *Courvoisier* v. *Raymond* (1896).[21] In this case, the defendant, a storekeeper, was threatened by a rioting mob. When a man who happened to be a plainclothes policeman walked up to the defendant, trying to help him, the defendant, mistaking him for a rioter, shot the policeman. Should the storekeeper have been liable?

The trial court decided the case properly — on the basis of strict liability — and the jury decided for the policeman. For it is clear that the defendant committed a battery by shooting the plaintiff. In

Ala. 637, 638 (1921). In Prosser, *Law of Torts,* p. 36. Also see Epstein, *Cases on Torts,* pp. 903ff.

[21] *Courvoisier* v. *Raymond,* 23 Colo. 113, 47 Pac. 284 (1896), and discussion by Epstein in *Cases on Torts,* pp. 21-23; and in Richard A. Epstein, "A Theory of Strict Liability," *Journal of Legal Studies* 2 (January 1973): 173.

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strict liability theory, the question is causation: Who initiated the tort or crime? An overriding defense for the defendant's action was if the plaintiff *in fact* had committed an assault, threatening an imminent initiation of a battery against him. The question traditionally then becomes a factual one for juries to decide: Did the plainclothesman in fact threaten battery against the storekeeper? The jury decided for the policeman.[22] The appeals court, however, reversed the trial court's decision. To the court, the storekeeper acted as a "reasonable man" when he concluded, though incorrectly, that the plainclothesman was out to attack him.

When is an act to be held an assault? Frowning would scarcely qualify. But if Jones had whipped out a gun and pointed it in Smith's direction, though not yet fired, this is clearly a threat of imminent aggression, and would properly be countered by Smith plugging Jones in self-defense. (In this case, our view and the "reasonable man" theory would again coincide.) The proper yardstick for determining whether the point of assault had been reached is this: Did Jones initiate an "overt act" threatening battery? As Randy Barnett has pointed out:

> In a case less than a certainty, the only justifiable use of force is that used to repel an overt act that is something more than mere preparation, remote from time and place of the intended crime. It must be more than 'risky'; it must be done with the specific intent to commit a crime and directly tend in some substantial degree to accomplish it."[23]

Similar principles hold in innocent-bystander cases. Jones assaults and attacks Smith; Smith, in self-defense, shoots. The shot goes wild and accidentally hits Brown, an innocent bystander. Should Smith be liable? Unfortunately, the courts, sticking to the traditional "reasonable man" or "negligence" doctrine, have held that Smith is not liable if indeed he was reasonably intending self-defense against Jones.[24] But, in libertarian and in strict liability

[22] As Epstein puts it, "Under a theory of strict liability, the statement of the prima facie case is evident: the defendant shot the plaintiff. The only difficult question concerns the existence of a defense which takes the form, the plaintiff assaulted the defendant. That question is a question of fact, and the jury found in effect that the plaintiff did not frighten the defendant into shooting him." Ibid.

[23] Randy E. Barnett, "Restitution: A New Paradigm of Criminal Justice," in R. Barnett and J. Hagel, eds., *Assessing the Criminal: Restitution, Retribution, and the Legal Process* (Cambridge, Mass.: Ballinger Publishing Co., 1977), p. 377. Barnett has since pointed out that his article was in error in mentioning "specific intent to commit a crime"; the important emphasis is on *action* constituting a crime or tort rather than the intent involved.

[24] See *Morris* v. *Platt,* 32 Conn 75 (1864), and the discussion by Epstein in *Cases on Torts,* pp. 22-23.

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theory, Smith has indeed aggressed against Brown, albeit unintentionally, and must pay for this tort. Thus, Brown has a proper legal action against Smith. Since Jones coerced or attacked Smith, Smith also has an independent and proper action for assault or battery against Jones. Presumably, the liability or punishment against Jones would be considerably more severe than against Smith.

One of the great flaws in the orthodox negligence approach has been to focus only on one victim's (Smith's) right of self-defense in repelling an attack, or on his good-faith mistake. But orthodox doctrine unfortunately neglects the other victim — the man frowning across the street, the plainclothesman trying to save someone, the innocent bystander. The *plaintiff's* right of self-defense is being grievously neglected. The proper point to focus on in all these cases is: Would the plaintiff have had the right to plug the defendant in *his* self-defense? Would the frowning man, the plainclothesman, the innocent bystander, if he could have done so in time, have had the right to shoot the sincere but erring defendants in self-defense? Surely, whatever our theory of liability, the answer must be "yes"; hence, the palm must go to the strict liability theory, which focuses on everyone's right of self-defense and not just that of a particular defendant. For it is clear that since these plaintiffs had the right to plug the defendant in self-defense, then the defendant must have been the tortious aggressor, regardless of how sincere or "reasonable" his actions may have been.

From various illuminating discussions of Professor Epstein, it seems evident that there are three contrasting theories of tort liability interwoven in our legal structure. The oldest, strict causal liability, apportioned blame and burden on the basis of identifiable cause: Who shot whom? Who assaulted whom? Only defense of person and property was a proper defense against a charge of using force. This doctrine was replaced during the 19th century by negligence or "reasonable man" theory, which let many guilty defendants off the hook if their actions were judged reasonable or did not exhibit undue negligence. In effect, negligence theory swung the balance excessively in favor of the defendant and against the plaintiff. In contrast, modern theory emerging increasingly in the 20th century, anxious to help plaintiffs (especially if they are poor), seeks ways to find against defendants even if strict cause of physical invasion cannot be proven. If the oldest theory is termed "strict causal liability," the modern one might be termed "presumptive liability," since the presumption seems to be against the defendant, in flagrant violation of the Anglo-Saxon *criminal law* presumption of

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innocence on the part of the defendant.[25]

Extending our discussion from crimes against the person to crimes against property, we may apply the same conclusion: Anyone has the right to defend his property against an overt act initiated against it. He may not move with force against an alleged aggressor — a trespasser against his land or chattels — until the latter initiates force by an overt act.

How much force may a victim use to defend either his person or his property against invasion? Here we must reject as hopelessly inadequate the current legal doctrine that he may use only "reasonable" force, which in most cases has reduced the victim's right to defend himself virtually to a nullity.[26] In current law, a victim is only allowed to use maximal, or "deadly" force, (a) in his own home, and then only if he is under direct personal attack; or (b) if there is no way that he can retreat when he is personally under attack. All this is dangerous nonsense. *Any* personal attack might turn out to be a murderous one; the victim has no way of knowing whether or not the aggressor is going to stop short of inflicting a grave injury upon him. The victim should be entitled to proceed on the assumption that *any* attack is implicitly a deadly one, and therefore to use deadly force in return.

In current law, the victim is in even worse straits when it comes to defending the integrity of his own land or movable property. For there, he is not even allowed to use deadly force in defending his own home, much less other land or properties. The reasoning seems to be that since a victim would not be allowed to kill a thief who steals his watch, he should therefore not be able to shoot the thief in the process of stealing the watch or in pursuing him. But punishment and defense of person or property are not the same, and must be treated differently. Punishment is an act of retribution after the crime has been committed and the criminal apprehended, tried, and convicted. Defense while the crime is being committed, or until property is recovered and the criminal apprehended, is a very different story. The victim should be entitled to use any force, including deadly force, to defend or to recover his property so long as the crime *is in the process of commission* — that is, until the

[25] On the relationship between the criminal and tort law, see section entitled "Collapsing Crime Into Tort."

[26] While modern law discriminates against the defendant in economic cases, it discriminates heavily against the victim in his use of personal force in self-defense. In other words, the state is allowed to use excessive force through the courts in economic cases (where corporations or the wealthy are defendants), but individual victims are scarcely allowed to use force at all.

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criminal is apprehended and duly tried by legal process. In other words, he should be able to shoot looters.[27]

The Proper Burden of Risk

We conclude, then, that no one may use force to defend himself or his property until the initiation of an overt act of aggression against him. But doesn't this doctrine impose an undue risk upon everyone?

The basic reply is that life is always risky and uncertain and that there is no way of getting round this primordial fact. Any shifting of the burden of risk away from one person simply places it upon someone else. Thus, if our doctrine makes it more risky to wait until someone begins to aggress against you, it also makes life *less* risky, because as a non-aggressor, one is more assured that no excited alleged victim will pounce upon you in supposed "self-defense." There is no way for the law to reduce risk overall; it then becomes important to use some other principle to set the limits of permissible action, and thereby to allocate the burdens of risk. The libertarian axiom that all actions are permissible except overt acts of aggression provides such a principled basis for risk allocation.

There are deeper reasons why overall risks cannot be reduced or minimized by overt legal action. Risk is a subjective concept unique to each individual; therefore, it cannot be placed in measurable quantitative form. Hence, no one person's quantitative degree of risk can be compared to another's, and no overall measure of social risk can be obtained. As a quantitative concept, overall or social risk is fully as meaningless as the economist's concept of "social costs" or social benefits.

In a libertarian world, then, everyone would assume the "proper burden of risk"[28] placed upon him as a free human being responsi-

[27] For the current state of legal doctrine, see Prosser, *Law of Torts,* pp. 108-125, 134ft. As Epstein indicates, basing the proper limits of self-defense on permissible punishment would imply that in jurisdictions that have abolished capital punishment, no one may use deadly force even in self-defense against a deadly attack. So far the courts have not been willing to embrace this *reductio ad absurdum* of their own position. Epstein, *Cases on Torts,* p. 30.

[28] This is the same concept but a different name from Williamson Evers' pioneering phrase, "the proper assumption of risk." The current phrase avoids confusion with the concept of "assumption of risk" in tort law, which refers to risk voluntarily assumed by a plaintiff and that therefore negates his attempts at action against a defendant. The "proper burden of risk" is related to the legal concept but refers to what risk *should* be assumed by each person in accordance with the nature of man and of a free society, rather than what risk had voluntarily been incurred by a plaintiff. See Rothbard, "Nozick and the State," pp. 49-50.

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ble for himself. That would be the risk involved in each man's person and property. Of course, individuals could voluntarily pool their risks, as in various forms of insurance, in which risks are shared and benefits paid to losers from the pool. Or, speculators could voluntarily assume risks of future price changes that are sloughed off by others in hedging operations on the market. Or, one man could assume another's risks for payment, as in the case of performance and other forms of bonding. What would not be permissible is one group getting together and deciding that another group should be *forced* into assuming their risks. If one group, for example, forces a second group to guarantee the former's incomes, risks are greatly increased for the latter, to the detriment of their individual rights. In the long run, of course, the whole system might collapse, since the second group can only provide guarantees out of their own production and incomes, which are bound to fall as the burden of social parasitism expands and cripples society.

The Proper Burden of Proof

If every man's proper burden of risk is to refrain from coercion unless an overt act against his person or property has been initiated against him,[29] then what is the proper burden of proof against a defendant?

First, there must be *some* rational standards of proof for libertarian principles to operate. Suppose that the basic axiom of libertarianism — no initiation of force against person or property — is enshrined in all judicial proceedings. But suppose that the only criterion of proof is that all persons under six feet tall are considered guilty while all persons over six feet tall are held to be innocent. It is clear that these procedural standards of proof would be in direct and flagrant violation of libertarian principles. So would tests of proof in which irrelevant or random occurrences would decide the case, such as the medieval trial by ordeal or trial by tea leaves or astrological charts.

From a libertarian point of view, then, proper procedure calls for rational proof about the guilt or innocence of persons charged with tort or crime. Evidence must be probative in demonstrating a strict causal chain of acts of invasion of person or property. Evidence must be constructed to demonstrate that aggressor A in fact

[29] Or an overt act against someone else. If it is legitimate for a person to defend himself or his property, it is then equally legitimate for him to call upon other persons or agencies to aid him in that defense, or to pay them for this defense service.

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initiated an overt physical act invading the person or property of victim B.[30]

Who, then, should bear the burden of proof in any particular case? And what criterion or standard of proof should be satisfied?

The basic libertarian principle is that everyone should be allowed to do whatever he or she is doing unless committing an overt act of aggression against someone else. But what about situations where it is unclear whether or not a person is committing aggression? In those cases, the only procedure consonant with libertarian principle is to do nothing; to lean over backwards to ensure that the judicial agency is not coercing an innocent man.[31] If we are unsure, it is far better to let an aggressive act slip through than to impose coercion and therefore to commit aggression ourselves.[32] A fundamental tenet of the Hippocratic oath, "at least, do not harm," should apply to legal or judicial agencies as well.

The presumption of every case, then, must be that every defendant is innocent until proven guilty, and the burden of proof must be squarely upon the plaintiff.[33]

If we must always insist on *laissez-faire,* then it follows that such a weak standard of proof as "preponderance of evidence" must not

[30]Thayer, in his classical treatise on evidence, wrote: "There is a principle . . . a presupposition involved in the very conception of a rational system of evidence . . . which forbids receiving anything irrelevant, not logically probative . . ." Thayer, *Preliminary Treatise on Evidence* (1898), pp. 264ff., cited in E.W. Cleary, ed., *McCormick's Handbook of the Law of Evidence,* 2d ed., (St. Paul, Minn.: West Publishing Co., 1972), p. 433.

[31]Benjamin R. Tucker, the leading individualist-anarchist thinker of the late 19th century, wrote: "No use of force, except against the invader; and in those cases where it is difficult to tell whether the alleged offender is an invader or not, still no use of force except where the necessity of immediate solution is so imperative that we must use it to save ourselves." Benjamin R. Tucker, *Instead of a Book* (New York: B.R. Tucker, 1893), p. 98. Also see ibid., pp. 74-75.

[32]Cleary puts the point well, though he unfortunately applies it only to criminal cases: "Society has judged that it is significantly worse for an innocent man to be found guilty of a crime then for a guilty man to go free. . . . Therefore, as stated by the Supreme Court in recognizing the inevitability of error in criminal cases '. . . this margin of error is reduced as to him [the defendant] by the process of placing on the other party the burden . . . of persuading the factfinder at the conclusion of the trial of his guilt beyond a reasonable doubt.' In so doing, the courts have . . . the worthy goal of decreasing the number of one kind of mistake — conviction of the innocent." *McCormick's Handbook of Evidence,* pp. 798-799.

[33]The burden of proof is also on the plaintiff in contemporary law. Cleary writes: "The burdens of pleading and proof with regard to most facts have been and should be assigned to the plaintiff who generally seeks to change the present state of affairs and who therefore naturally should be expected to bear the risk of failure of proof or persuasion." Ibid., p. 786. Cleary also speaks of "the natural tendency to place the burdens on the party desiring change." Ibid., pp. 788-789.

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be allowed to serve as a demonstration of guilt. If the plaintiff produces evidence adjudged in some sense to weigh a mere 51 percent on behalf of the guilt of the defendant, this is scarcely better than random chance as justification for the court's using force against the defendant. Presumption of innocence, then, must set a far higher standard of proof.

At present, "preponderance of evidence" is used to decide civil cases, whereas a far tougher standard is used for criminal cases, since penalties are so much stiffer. But, for libertarians, the test of guilt must not be tied to the degree of punishment; regardless of punishment, guilt involves coercion of some sort levied against the convicted defendant. Defendants deserve as much protection in civil torts as in criminal cases.[34]

A few judges, properly shocked by the dominant view that a mere 51 percent of the evidence may serve to convict, have changed the criterion to make sure whoever is trying the case — judge or jury — is *convinced* of guilt by the preponderance of evidence. A more satisfactory criterion, however, is that the trier must be convinced of the defendant's guilt by "clear, strong, and convincing proof."[35] Fortunately, this test has been used increasingly in civil cases in recent years. Better yet were stronger but generally rejected formulations of certain judges such as "clear, positive, and unequivocal" proof, and one judge's contention that the phrase means that the plaintiffs "must . . . satisfy you to a moral certainty."[36]

But the best standard for any proof of guilt is the one commonly used in criminal cases: Proof "beyond a reasonable doubt." Obviously, *some* doubt will almost always persist in gauging people's actions, so that such a standard as "beyond a scintilla of doubt" would be hopelessly unrealistic. But the doubt must remain small enough that any "reasonable man" will be convinced of the fact of the defendant's guilt. Conviction of guilt "beyond a reasonable doubt" appears to be the standard most consonant with libertarian principle.

The outstanding 19th century libertarian constitutional lawyer, Lysander Spooner, was an ardent advocate of the "beyond a reasonable doubt" standard for all guilt:

> the lives, liberties, and properties of men are too valuable to them, and the natural presumptions are too strong in their favor,

[34] See section entitled "Collapsing Crime Into Tort."

[35] See *McCormick's Handbook of Evidence,* pp. 794ff.

[36] Ibid., p. 796. Here we must hail the scorned trial judges in *Molyneux* v. *Twin Falls Canal Co.,* 54 Idaho 619, 35 P. 2d 651, 94 A.L.R. 1264 (1934), and *Williams* v. *Blue Ridge Building & Loan Assn.,* 207 N.C. 362, 177 S.E. 176 (1934).

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> to justify the destruction of them by their fellowmen on a mere balancing of probabilities, *or on any ground whatever short of certainty beyond a reasonable doubt.* (italics Spooner's)[37]

While the reasonable doubt criterion generally has not been used in civil cases, a few precedents do exist for this seemingly bold and shocking proposal. Thus, in the claim of an orally offered gift in a probate case, the court ruled that the alleged gift "must be proven by forceful, clear and conclusive testimony which convinces the court beyond a reasonable doubt of its truthfulness." And in a suit to revise a written contract, the court ruled that the mistake must be "established by evidence so strong and conclusive as to place it beyond reasonable doubt."[38]

Strict Causality

What the plaintiff must prove, then, beyond a reasonable doubt is a strict causal connection between the defendant and his aggression against the plaintiff. He must prove, in short, that A actually "caused" an invasion of the person or property of B.

In a brilliant analysis of causation in the law, Professor Epstein has demonstrated that his own theory of strict tort liability is intimately connected to a direct, strict, common-sense view of "cause." Causal propositions in a strict liability view of the law take such form as, "A hit B," "A threatened B," or "A compelled B to hit C." Orthodox tort theory, in contrast, by stressing liability for "negligence" rather than for direct aggressive action, is tangled up with vague and complex theories of "cause," far removed from the common-sense "A hit B" variety. Negligence theory postulates a vague, "philosophical" notion of "cause in fact" that virtually blames everyone and no one, past, present and future for every act, and then narrows cause in a vague and unsatisfactory manner to "proximate cause" in the specific case. The result, as Epstein trenchantly points out, is to vitiate the concept of cause altogether and to set the courts free to decide cases arbitrarily and in accordance with their own views of social policy.[39]

[37] C. Shiveley, ed., *The Collected Works of Lysander Spooner* (Weston, Mass.: M & S Press, 1971), II, pp. 208-209. It should be pointed out that Spooner, too, made no distinction between civil and criminal cases in this regard. I am indebted to Williamson Evers for this reference.

[38] *St. Louis Union Trust Co.* v. *Busch,* 36 Mo. 1237, 145 S.W. 2d 426, 430 (1940); *Ward* v. *Lyman,* 108 Vt. 464, 188 A. 892, 893 (1937). *McCormick's Handbook of Evidence,* pp. 797, 802.

[39] According to Epstein: "Once it is decided that there is no hard content to the term

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To establish guilt and liability, strict causality of aggression leading to harm must meet the rigid test of proof beyond a reasonable doubt. Hunch, conjecture, plausibility, even mere probability are not enough. In recent years, statistical correlation has been commonly used, but it cannot establish causation, certainly not for a rigorous legal proof of guilt or harm. Thus, if lung cancer rates are higher among cigarette smokers than noncigarette smokers, this does not in itself establish proof of causation. The very fact that many smokers never get lung cancer and that many lung cancer sufferers have never smoked indicates that there are other complex variables at work. So that while the correlation is suggestive, it hardly suffices to establish medical or scientific proof; *a fortiori* it can still less establish any sort of legal guilt (if, for example, a wife who develops lung cancer should sue a husband for smoking and therefore injuring her lungs).[40]

Milton Katz points out, in a case where the plaintiff sued for air pollution damage:

> Suppose the plaintiff should claim serious damage: for emphysema, perhaps, or for lung cancer, bronchitis or some other comparably serious injury to his lungs. He would face a problem of proof of causation. . . . Medical diagnoses appear to have established that sulphur dioxide and other air pollutants often play a significant role in the etiology of emphysema and other forms of lung damage. But they are by no means the only possible causative factors. Emphysema and lung cancer are complex ill-

causation, the courts are free to decide particular lawsuits in accordance with the principles of 'social policy' under the guise of proximate-cause doctrine." Epstein, "Strict Liability," p. 163. Such nebulous and unworkable concepts as "substantial factor" in a damage or "reasonably foreseeable" have been of little help in guiding decisions on "proximate cause." For an excellent critique of "but for" tests for "cause in fact" in negligence theory, as well as the Chicago-Posnerite attempt to scrap the concept of cause altogether in tort law, see ibid., pp. 160-162; 163-166.

[40] If a long-time smoker who develops lung cancer should sue a cigarette company, there are even more problems. Not the least is that the smoker had voluntarily assumed the risk, so that this situation could hardly be called an aggression or tort. As Epstein writes, "Suppose plaintiff smoked different brands of cigarettes during his life? Or always lived in a smog-filled city? And if plaintiff surmounts the causal hurdle, will he be able to overcome the defense of assumption of risk?" Epstein, *Cases on Torts,* p. 257. Also see Richard A. Wegman, "Cigarettes and Health: A Legal Analysis," *Cornell Law Quarterly* 51 (Summer 1966): 696-724.

A particularly interesting cancer tort case that is instructive on the question of strict causality is *Kramer Service Inc.* v. *Wilkins* 184 Miss. 483, 186 So. 625 (1939), in Epstein, *Cases on Torts,* p. 256. The court summed up the proper status of medical causal evidence in *Daly* v. *Bergstedt* (1964), 267 Minn. 244, 126 N.W. 2d 242. In Epstein, *Cases on Torts,* p. 257. Also see Epstein's excellent discussion, ibid., of *DeVere* v. *Parten* (1946), in which the plaintiff was properly slapped down in an absurd attempt to claim that the defendant was responsible for a disease she had contracted.

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> nesses which may originate in a variety of causes, for example, cigarette smoking, to name one familiar example. If and when the plaintiff should succeed in establishing that the defendants' conduct polluted the air of his home, it would not follow that the pollution caused his illness. The plaintiff would still have to meet the separate burden of proving the etiology of his lung damage. . . ."[41]

Thus, a strict causal connection must exist between an aggressor and a victim, and this connection must be provable beyond a reasonable doubt. It must be causality in the common-sense concept of strict proof of the "A hit B" variety, not mere probability or statistical correlation.

Liability of the Aggressor Only

Under strict liability theory, it might be assumed that if "A hit B," then A is the aggressor and that therefore A and only A is liable to B. And yet the legal doctrine has arisen and triumphed, approved even by Professor Epstein, in which sometimes C, innocent and not the aggressor, is *also* held liable. This is the notorious theory of "vicarious liability."

Vicarious liability grew up in medieval law, in which a master was responsible for the torts committed by his servants, serfs, slaves, and wife. As individualism and capitalism developed, the common law changed, and vicarious liability disappeared in the 16th and 17th centuries, when it was sensibly concluded that "the master should not be liable for his servant's torts unless he had commanded the particular act."[42]

Since the 18th and 19th centuries, however, the vicarious liability of masters or employers is back with a vengeance. As long as the tort is committed by the employee in the course of furthering, even if only in part, his employer's business, then the employer is also liable. The only exception is when the servant goes "on a frolic of his own" unconnected with the employer's business. Prosser writes:

> The fact that the servant's act is expressly forbidden by the master, or is done in a manner which he has prohibited, is . . . usually not conclusive, and does not in itself prevent an act from being within the scope of employment [and therefore making the master liable]. A master cannot escape liability merely by ordering his servant to act carefully. . . . Thus instructions to a sales

[41] Milton Katz, "The Function of Tort Liability in Technology Assessment," *Cincinnati Law Review* 38 (Fall 1969): 620.
[42] Prosser, *Law of Torts*, p. 458.

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> clerk never to load a gun while exhibiting it will not prevent liability when the clerk does so, in an effort to sell the gun. . . . [T]he master cannot escape responsibility no matter how specific, detailed, and emphatic his orders may have been to the contrary. This has been clear since the leading English case (*Limpus* v. *London General Omnibus Co.*, [1862] 1H. & C. 526, 158 Eng. Rep. 993) in which an omnibus company was held liable notwithstanding definite orders to its driver not to obstruct other vehicles.[43]

Even more remarkably, the master is now held responsible even for intentional torts committed by the servant without the master's consent:

> In general, the master is held liable for any intentional tort committed by the servant where its purpose, however misguided, is wholly or in part to further the master's business.
>
> Thus he will be held liable where his bus driver crowds a competitor's bus into a ditch, or assaults a trespasser to eject him from the bus, or a salesman makes fraudulent statements about the products he is selling . . .[44]

Prosser is properly scornful of the tortured reasoning by which the courts have tried to justify a legal concept so at war with libertarianism, individualism, and capitalism, and suited only to a pre-capitalist society:

> A multitude of very ingenious reasons have been offered for the vicarious liability of a master: he has a more or less fictitious "control" over the behavior of a servant; he has "set the whole thing in motion," and is therefore responsible for what has happened; he has selected the servant and trusted him, and so should suffer for his wrongs, rather than an innocent stranger who has had no opportunity to protect himself; it is a great concession that any man should be permitted to employ another at all, and there should be a corresponding responsibility as the price to be paid for it. . . . Most courts have made little or no effort to explain the result, and have taken refuge in rather empty phrases, such as . . . the endlessly repeated formula of "respondeat superior," which in itself means nothing more than "look to the man higher up."[45]

In fact, as Prosser indicates, the only real justification for vicarious liability is that employers generally have more money than employees, so that it becomes more convenient (if one is not the employer), to stick the wealthier class with the liability. In the cynical words of Thomas Baty: "In hard fact, the reason for the employers' liability is the damages are taken from a deep pocket."[46]

[43] Ibid., p. 461.
[44] Ibid., p. 464.
[45] Ibid., p. 459.
[46] Ibid.

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In opposition, too, we have Justice Holmes' lucid critique: "I assume that common-sense is opposed to making one man pay for another man's wrong, unless he has actually brought the wrong to pass. . . . I therefore assume that common-sense is opposed to the fundamental theory of agency."[47]

One would expect that in a strict causal liability theory, vicarious liability would be tossed out with little ceremony. It is therefore surprising to see Professor Epstein violate the spirit of his own theory. He seems to have two defenses for the doctrine of respondeat superior and vicarious liability. One is the curious argument that "just as the employer gets and benefits from the gains for his worker's activities, so too should he be required to bear the losses from these activities."[48] This statement fails to appreciate the nature of voluntary exchange: Both employer and employee benefit from the wage contract. Moreover, the employer does bear the "losses" in the event his production (and, therefore, his resources) turn out to be misdirected. Or, suppose the employer makes a mistake and hires an incompetent person, who is paid $10,000. The employer may fire this worker, but he and he alone bears the $10,000 loss. Thus, there appears to be no legitimate reason for forcing the employer to bear the *additional* cost of his employee's tortious behavior.

Epstein's second argument is contained in the sentence: "X corporation hurt me because its servant did so in the course of his employment." Here Epstein commits the error of conceptual realism, since he supposes that a "corporation" actually exists, and that it committed an act of aggression. In reality, a "corporation" does not act; only individuals act, and each must be responsible for his own actions and those alone. Epstein may deride Holmes' position as being based on the "nineteenth century premise that individual conduct alone was the basis of individual responsibility," but Holmes was right nevertheless.[49]

A Theory of Just Property: Homesteading

There are two fundamental principles upon which the libertarian theory of just property rests: (a) Everyone has absolute property right over his or her own body; and (b) everyone has an absolute property right over previously unowned natural resources (land)

[47] In his *Harvard Law Review* articles on "Agency," 1891. See Epstein, *Cases on Torts,* p. 705.
[48] Ibid., p. 707.
[49] Ibid., p. 705.

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which he first occupies and brings into use (in the Lockean phrase, "Mixing his labor with the land").

The "first ownership to first use" principle for natural resources is also popularly called the "homesteading principle." If each man owns the land that he "mixes his labor with," then he owns the product of that mixture, and he has the right to exchange property titles with other, similar producers. This establishes the right of free contract in the sense of transfer of property titles. It also establishes the right to give away such titles, either as a gift or bequest.

Most of us think of homesteading unused resources in the old-fashioned sense of clearing a piece of unowned land and farming the soil. There are, however, more sophisticated and modern forms of homesteading, which should establish a property right. Suppose, for example, that an airport is established with a great deal of empty land around it. The airport exudes a noise level of, say, X decibels, with the sound waves traveling over the empty land. A housing development then buys land near the airport. Some time later, the homeowners sue the airport for excessive noise interfering with the use and quiet enjoyment of the houses.

Excessive noise can be considered a form of aggression but in this case the airport has already homesteaded X decibels worth of noise. By its prior claim, the airport now "owns the right" to emit X decibels of noise into the surrounding area. In legal terms, we can then say that the airport, through homesteading, has earned an *easement right* to creating X decibels of noise. This homestead easement is an example of the ancient legal concept of "prescription," in which a certain activity earns a prescriptive property right in the person engaging in the action.

On the other hand, if the airport starts to *increase* noise levels, then the homeowners could sue or enjoin the airport from its noise aggression for the extra decibels, which had not been homesteaded. Of course if a new airport is built and begins to send out noise of X decibels onto the existing surrounding homes, the airport becomes fully liable for the noise invasion.

It should be clear that the same theory should apply to air pollution. If A is causing pollution of B's air, and this can be proven beyond a reasonable doubt, then this is aggression and it should be enjoined and damages paid in accordance with strict liability, *unless* A had been there first and had already been polluting the air before B's property was developed. For example, if a factory owned by A polluted originally unused property, up to a certain amount of pollutant X, then A can be said to have *homesteaded a pollution easement* of a certain degree and type.

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Given a prescriptive easement, the courts have generally done well in deciding its limits. In *Kerlin* v. *Southern Telephone and Telegraph Co.* (1941), a public utility had maintained an easement by prescription of telephone poles and wires over someone else's land (called the "servient estate" in law). The utility wished to string up two additional wires, and the servient estate challenged its right to do so. The court decided correctly that the utility had the right because there was no proposed change in the "outer limits of space utilized by the owner of the easement. . . ." On the other hand, an early English case decided that an easement for moving carts could not later be used for the purpose of driving cattle.[50]

Unfortunately, the courts have not honored the concept of homestead in a noise or pollution easement. The classic case is *Sturges* v. *Bridgman* (1879) in England. The plaintiff, a physician, had purchased land in 1865; on the property next to him the defendant, a pharmacist, used a mortar and pestle, which caused vibrations on the physician's property. There was no problem, however, until the physician built a consultation room 10 years later. He then sued to enjoin the pharmacist, claiming that his work constituted a nuisance. The defendant properly argued that the vibrations were going on before the construction of the consultation room, that they then did not constitute a nuisance, and that therefore he had a prescriptive right to keep operating his business. Nevertheless, defendant's claim was denied.

Consequently, we have such injustice as compulsory changes of character in a business and a failure to provide prescription through first use. Thus, Prosser notes that "the character of a district may change with the passage of time, and the industry set up in the open country may become a nuisance, or be required to modify its activities, when residences spring up around it. It will acquire no prescriptive right . . ."[51] A just law would tell the later arriving residents that they knew what they were getting into, and that *they* must adapt to the industrial ambiance rather than vice-versa.

In some cases, however, the courts have held or at least considered that by the plaintiff's "coming to the nuisance," he has voluntarily entered a preexisting situation, and that therefore the defendant is not guilty. Prosser states that "in the absence of a

[50] *Kerlin* v. *Southern Telephone & Telegraph Co.* (Ga.), 191 Ga. 663, 13 S.E. 2d 790 (1941); *Ballard* v. *Dyson* (1808) 1 Taunt. 279, 127 Eng. Rep. 841. In William E. Burby, *Handbook of the Law of Real Property,* 3rd ed. (St. Paul, Minn.: West Publishing Co., 1965), pp. 84-85.

[51] Prosser, *Law of Torts,* pp. 600-601. Also see Burby, *Law of Real Property,* p. 78. *Sturges* v. *Bridgman* (1879), 11 Ch. Div. 852.

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prescriptive right the defendant cannot condemn the surrounding premises to endure the nuisance," but our whole point here is that the homesteader of a noise or a pollution easement has indeed earned that right in cases of "coming to the nuisance."[52]

Dominant court opinion, as in the case of *Ensign* v. *Walls* (1948), discards or minimizes "coming to the nuisance" and dismisses the idea of a homestead easement. But minority opinion has strongly supported it, as in the New York case of *Bove* v. *Donner-Hanna Coke Co.* (1932). Plaintiff had moved into an industrial region, where defendant was operating a coke oven on the opposite side of the street. When plaintiff tried to enjoin the coke oven out of existence, the court rejected the plea with these exemplary words:

> With all the dirt, smoke and gas which necessarily come from factory chimneys, trains and boats, and with full knowledge that this region was especially adapted for industrial rather than residential purposes, and that factories would increase in the future, plaintiff selected this locality as the site of her future home. She voluntarily moved into this district, fully aware of the fact that the atmosphere would constantly be contaminated by dirt, gas and foul odors; and that she could not hope to find in this locality the pure air of a strictly residential zone. She evidently saw certain advantages in living in this congested center. This is not the case of an industry, with its attendant noise and dirt, invading a quiet, residential district. This is just the opposite. Here a residence is built in an area naturally adapted for industrial purposes and already dedicated to that use. Plaintiff can hardly be heard to complain at this late date that her peace and comfort have been disturbed by a situation which existed, to some extent at least, at the very time she bought her property.[53]

Nuisances, Visible and Invisible

An invasion of someone else's land can be considered a *trespass* or a *nuisance,* and there is considerable confusion about the boundaries of each. For our purposes, the classic distinction between the two is important. Trespass occurs when "there is a physical entry that is a direct interference with the possession of land, which

[52] Prosser, *Law of Torts,* p. 611.

[53] *Bove* v. *Donner-Hanna Coke Corp.,* 236 App. Div. 37, 258 N.Y.S. 229 (1932), quoted in Epstein, *Cases on Torts,* p. 535. Contrary to Epstein, however, the coming-to-nuisance is not simply an assumption of risk on the part of the plaintiff. It is a stronger defense, for it rests on an actual assignment of property right in the "nuisance" creating activity, which is therefore absolute, overriding, and indefeasible. Cf. Richard A. Epstein, "Defenses and Subsequent Pleas in a System of Strict Liability," *Journal of Legal Studies* 3 (1974): 197-201.

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usually must be accomplished by a tangible mass.''[54] On the other hand, ''contact by minute particles or intangibles, such as industrial dust, noxious fumes, or light rays, has heretofore generally been held insufficient to constitute a trespassory entry, on the ground that there is no interference with possession, or that the entry is not direct, or that the invasion failed to qualify as an entry because of its imponderable or intangible nature.''[55]

These more intangible invasions qualify as private nuisances and can be prosecuted as such. A nuisance may be, as Prosser points out:

> an interference with the physical condition of the land itself, as by vibration or blasting which damages a house, the destruction of crops, flooding, raising the water table, or the pollution of a stream or of an underground water supply. It may consist of a disturbance of the comfort or convenience of the occupant, as by unpleasant odors, smoke or dust or gas, loud noises, excessive light or high temperatures, or even repeated telephone calls . . .[56]

Prosser sums up the difference between trespass and nuisance:

> Trespass is an invasion of the plaintiff's interest in the exclusive possession of his land, while nuisance is an interference with his use and enjoyment of it. The difference is that between . . . felling a tree across his boundary line and keeping him awake at night with the noise of a rolling mill.[57]

But what precisely does the difference between ''exclusive possession'' and ''interference with use'' mean? Furthermore, the practical difference between a tort action for trespass and for nuisance is that a trespass is illegal per se, whereas a nuisance, to be actionable, has to *damage* the victim beyond the mere fact of invasion itself. What, if any, is the justification for treating a trespass and nuisance so differently? And is the old distinction between tangible and invisible invasion really now obsolete, as Prosser maintains, ''in the light of modern scientific tests''?[58] Or, as a *Columbia Law Review* note put it:

[54] ''Note: Deposit of Gaseous and Invisible Solid Industrial Wastes Held to Constitute Trespass,'' *Columbia Law Review* 60 (1960): 879.

[55] Ibid., pp. 879-880. Also see Glen Edward Clover, ''Torts: Trespass, Nuisance and $E = mc^2$,'' *Oklahoma Law Review* 11 (1966): 118ff.

[56] Prosser, *Law of Torts,* pp. 591-592.

[57] Ibid., p. 595. A nuisance generally emanates *from* the land of A *to* the land of B; in short, stems from outside B's land itself. Prosser's attempt to rebut this point (defendant's dog howling under plaintiff's window or defendant's cattle roaming over the other's fields) misses the point. The offending dog and cattle themselves wandered over from the land of A, the defendant, and since they are domesticated, their deeds are the responsibility of their owners. On animals, see ibid., pp. 496-503.

[58] Ibid., p. 66.

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> The federal court . . . suggested that historically the reluctance of courts to find that invasion by gases and minute particles were trespassory resulted from the requirement that to find a trespass a court must be able to see some physical intrusion by tangible matter; it then found that this difficulty no longer exists because courts may today rely on scientific detecting methods, which can make accurate quantitative measurements of gases and minute solids, to determine the existence of a physical entry of tangible matter.[59]

The distinction between visible and invisible, however, is not completely swept away by modern scientific detection methods. Let us take two opposite situations. First, a direct trespass: A rolls his car onto B's lawn or places a heavy object on B's grounds. Why is this an invasion and illegal per se? Partly because, in the words of an old English case, "the law infers some damage; if nothing more, the treading down of grass or herbage."[60] But it is not just treading down; a tangible invasion of B's property interferes with his exclusive use of the property, if only by taking up tangible square feet (or cubic feet). If A walks on or puts an object on B's land, then B cannot use the space A or his object has taken up. An invasion by a tangible mass is a per se interference with someone else's property and therefore illegal.

In contrast, consider the case of radio waves, which is a crossing of other people's boundaries that is invisible and insensible in every way to the property owner. We are all bombarded by radio waves that cross our properties without our knowledge or consent. Are they invasive and should they therefore be illegal, now that we have scientific devices to detect such waves? Are we then to outlaw all radio transmission? And if not, why not?

The reason why not is that these boundary crossings do not interfere with anyone's exclusive possession, use or enjoyment of their property. They are invisible, cannot be detected by man's senses, and do no harm. They are therefore not really invasions of property, for we must refine our concept of invasion to mean not just boundary crossing, but boundary crossings that in some way interfere with the owner's use or enjoyment of his property. What counts is whether the senses of the property owner are interfered with.

But suppose it is later discovered that radio waves are harmful, that they cause cancer or some other illness? Then they *would* be interfering with the use of the property in one's person and should be

[59] "Note, Deposit of Wastes," pp. 880-881. Also see Clover, "Torts," p. 119.
[60] Prosser, *Law of Torts*, p. 66.

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illegal and enjoined, provided of course that this proof of harm and the causal connection between the specific invaders and specific victims are established beyond a reasonable doubt.

So we see that the proper distinction between trespass and nuisance, between strict liability per se and strict liability only on proof of harm, is not really based on "exclusive possession" as opposed to "use and enjoyment." The proper distinction is between visible and tangible or "sensible" invasion, which interferes with possession and use of the property, and invisible, "insensible" boundary crossings that do not and therefore should be outlawed only on proof of harm.

The same doctrine applies to low-level radiation, which virtually everyone and every object in the world emanates, and therefore everyone receives. Outlawing, or enjoining, low-level radiation, as some of our environmental fanatics seem to be advocating, would be tantamount to enjoining the entire human race and all the world about us. Low-level radiation, precisely because it is undetectable by man's senses, interferes with no one's use or possession of his property, and therefore may only be acted against upon strict causal proof of harm beyond a reasonable doubt.

The theory of homestead easements discussed earlier would require no restriction upon radio transmissions or on people's low-level radiation. In the case of radio transmissions, Smith's ownership of land and all of its appurtenances does *not* entitle him to own all radio waves passing over and across his land, for Smith has not homesteaded or transmitted on radio frequencies there. Hence, Jones, who transmits a wave on, say, 1200 kilohertz, homesteads the ownership of that wave as far as it travels, even if it travels across Smith's property. If Smith tries to interfere with or otherwise disrupt Jones' transmissions, he is guilty of interfering with Jones' just property.[61]

Only if the radio transmissions are proven to be harmful to Smith's person beyond a reasonable doubt should Jones' activities be subject to injunction. The same type of argument, of course, applies to radiation transmissions.

Between tangible trespass and radio waves or low-level radiation,

[61] During the 1920s, the courts were working out precisely such a system of homesteaded private property rights in airwave frequencies. It is because such a private property structure was evolving that Secretary of Commerce Hoover pushed through the Radio Act of 1927, nationalizing ownership of the airwaves. See Ronald H. Coase, "The Federal Communications Commission," *Journal of Law and Economics* 2 (October 1959): 1-40. For a modern study of how such frequencies could be allocated, see A. De Vany, et al., *A Property System Approach to the Electromagnetic Spectrum* (San Francisco: Cato Institute, 1980).

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there is a range of intermediate nuisances. How should they be treated?

Air pollution, consisting of noxious odors, smoke, or other visible matter, definitely constitutes an invasive interference. These particles can be seen, smelled, or touched, and should therefore constitute invasion per se, except in the case of homesteaded air pollution easements. (Damages beyond the simple invasion would, of course, call for further liability.) Air pollution, however, of gases or particles that are invisible or undetectable by the senses should not constitute aggression per se, because being insensible they do not interfere with the owner's possession or use. They take on the status of invisible radio waves or radiation, *unless* they are proven to be harmful, and until this proof and the causal connection from aggressor to victim can be established beyond a reasonable doubt.[62]

Excessive noise is certainly a tort of nuisance; it interferes with a person's enjoyment of his property, including his health. However, no one would maintain that every man has the right to live as if in a soundproofed room; only *excessive* noise, however vague the concept, can be actionable.

In a sense, life itself homesteads noise easements. Every area has certain noises, and people moving into an area must anticipate a reasonable amount of noise. As Terry Yamada ruefully concedes:

> An urban resident must accept the consequences of a noisy environment situation. Courts generally hold that persons who live or work in densely populated communities must necessarily endure the usual annoyances and discomforts of those trades and businesses located in the neighborhood where they live or work; such annoyances and discomforts, however, must not be more than those reasonably expected in the community and lawful to the conduct of the trade of business.[63]

In short, he who wants a soundproof room must pay for its installation.

The current general rule of the civil courts on nuisance suits for noise is cogent:

> A noise source is not a nuisance per se but only becomes a

[62] On prescriptive rights, tangibility, and the concept of "coming to the tort" in relation to air pollution, see William C. Porter, "The Role of Private Nuisance Law in the Control of Air Pollution," *Arizona Law Review* 10 (1968): 107-119; and Julian C. Juergensmeyer, "Control of Air Pollution Through the Assertion of Private Rights," *Duke Law Journal,* 1967, pp. 1126-1155.

[63] Terry James Yamada, "Urban Noise: Abatement, Not Adaptation," *Environmental Law* 6 (Fall 1975): 64. Unfortunately, like most authors writing on environmental law, Yamada writes like a fervent special pleader for environmental plaintiffs rather than as a searcher for objective law.

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> nuisance under certain conditions. These conditions depend on a consideration of the surrounding area, the time of day or night when the noise-producing activities take place and the manner in which the activity is conducted. A private nuisance is compensable only when it is unreasonable or excessive and when it produces actual physical discomfort or injury to a person of ordinary sensibilities so as to interfere with the use and enjoyment of the property.[64]

Owning the Technological Unit: Land and Air

In our discussion of homesteading, we did not stress the problem of the size of the area to be homesteaded. If A uses a certain amount of a resource, how much of that resource is to accrue to his ownership? Our answer is that he owns the *technological unit* of the resource. The size of that unit depends on the type of good or resource in question, and must be determined by judges, juries, or arbitrators who are expert in the particular resource or industry in question. If resource X is owned by A, then A must own enough of it so as to include necessary appurtenances. For example, in the courts' determination of radio frequency ownership in the 1920s, the extent of ownership depended on the technological unit of the radio wave — its width on the electromagnetic spectrum so that another wave would not interfere with the signal, and its length over space. The ownership of the frequency then was determined by width, length, and location.

American land settlement is a history of grappling, often unsuccessfully, with the size of the homestead unit. Thus, the homesteading provision in the federal land law of 1861 provided a unit of 160 acres, the clearing and use of which over a certain term would convey ownership to the homesteader. Unfortunately, in a few years, when the dry prairie began to be settled, 160 acres was much too low for any viable land use (generally ranching and grazing). As a result, very little Western land came into private ownership for several decades. The resulting overuse of the land caused the destruction of Western grass cover and much of the timberland.

With the importance of analyzing the technological unit in mind, let us examine the ownership of airspace. Can there be private ownership of the air, and if so, to what extent?

The common law principle is that every landowner owns all the

[64] Yamada, "Urban Noise," p. 63. Note, however, that in our view the requirement of "unreasonable" for actual injury or discomfort is correct for noise but not, say, for visible smoke or noxious odors, unless "discomfort" is interpreted broadly so as to include all interference with use.

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airspace above him upward indefinitely unto the heavens and downward into the center of the earth. In Lord Coke's famous dictum: *cujus est solum ejus est usque ad coelum;* that is, he who owns the soil owns upward unto heaven, and, by analogy, downward to Hades. While this is a time-honored rule, it was, of course, designed before planes were invented. A literal application of the rule would in effect outlaw all aviation, as well as rockets and satellites.[65]

But is the practical problem of aviation the only thing wrong with the *ad coelum* rule? Using the homesteading principle, the *ad coelum* rule never made any sense, and is therefore overdue in the dustbin of legal history. If one homesteads and uses the soil, in what sense is he also using all the sky above him up into heaven? Clearly, he isn't.

The *ad coelum* rule unfortunately lingered on in the *Restatement of Torts* (1939), adopted by the Uniform State Law for Aeronautics and enacted in 22 states during the 1930s and 1940s. This variant continued to recognize unlimited ownership of upward space, but added a superior public privilege to invade that right. Aviators and satellite owners would still bear the burden of proof that they possessed this rather vague privilege to invade private property in airspace. Fortunately, the Uniform Act was withdrawn by the Commissioners on Uniform State Laws in 1943, and is now on the way out.

A second solution, adopted by the Ninth Circuit federal court in 1936, scrapped private property in airspace altogether and even allowed planes to buzz land close to the surface. Only actual interference with present enjoyment of land would constitute a tort.[66] The most popular nuisance theory simply outlaws interference with land use, but is unsatisfactory because it scraps any discussion whatever of ownership of airspace.

The best judicial theory is the "zone" theory, which asserts that only the lower part of the airspace above one's land is owned; this zone is the limit of the owner's "effective possession." As Prosser defines it, "effective possession" is "so much of the space above him as is essential to the complete use and enjoyment of the land."[67] The height of the owned airspace will vary according to the facts of the case and therefore according to the "technological unit." Thus, Prosser writes:

[65] See the discussion of various theories of land and air ownership in Prosser, *Law of Torts,* pp. 70-73.
[66] In *Hinman* v. *Pacific Air Transport,* 9 Cir. (1936), 84 F.2d 755, cert. denied 300 U.S. 654. In ibid., p. 71.
[67] Ibid., p. 70.

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> This was the rule applied in the early case of *Smith* v. *New England Aircraft Co.*, where flights at the level of one hundred feet were held to be trespasses, since the land was used for the cultivation of trees which reached that height. A few other cases have adopted the same view. The height of the zone of ownership must vary according to the facts of each case . . .[68]

On the other hand, the nuisance theory should be added to the strict zone of ownership for cases such as where excess aircraft noise injures people or activities in an adjoining area, not directly underneath the plane. At first, the federal courts ruled that only low flights overhead could constitute a tort against private landowners, but the excessive noise case of *Thornburg* v. *Port of Portland* (1962) corrected that view. The court properly reasoned in *Thornburg:*

> If we accept . . . the validity of the propositions that a noise can be a nuisance; that a nuisance can give rise to an easement; and that a noise coming straight down from above one's land can ripen into a taking if it is persistent enough and aggravated enough, then logically the same kind and degree of interference with the use and enjoyment of one's land can also be a taking even though the noise vector may come from some direction other than the perpendicular.[69]

While there is no reason why the concept of ownership of airspace cannot be used to combat air pollution torts, this has rarely been done. Even when *ad coelum* was riding high, it was used against airplane overflights but not to combat pollution of one's air, which was inconsistently considered as a communal resource. The law of nuisance could traditionally be used against air pollution, but until recently it was crippled by "balancing of the equities," negligence rules against strict liability, and by declaration that "reasonable" air pollution was not actionable. In the classic case of *Holman* v. *Athens Empire Laundry Co.* (1919), the Supeme Court of Georgia declared: "The pollution of the air, so far as reasonably necessary to the enjoyment of life and indispensable to the progress of society, is not actionable."[70] Fortunately, that attitude is now becoming obsolete.

[68] Ibid., pp. 70-71. See *Smith* v. *New England Aircraft Co.*, (193), 270 Mass. 511, 170 N.E. 385. Also see Prosser, *Law of Torts,* pp. 514-515.

[69] *Thornburg* v. *Port of Portland* (1962), 233 Ore. 178, 376 P.2d 103. Quoted in Clover, "Torts," p. 121. The previous view was based on *United States* v. *Causby* (1946). Also see Prosser, *Law of Torts,* pp. 72-73.

[70] *Holman* v. *Athens Empire Laundry Co.*, 149 Ga. 345, 350, 100 S.E. 207, 210 (1919). Quoted in Jack L. Landau, "Who Owns the Air? The Emission Offset Concept and Its Implications," *Environmental Law* 9 (1979): 589.

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Although air pollution should be a tort subject to strict liability, it should be emphasized that statements like "everyone has the right to clean air" are senseless. There are air pollutants constantly emerging from natural processes, and one's air is whatever one may happen to possess. The eruption of Mt. St. Helens should have alerted everyone to the ever-present processes of natural pollution. It has been the traditional and proper rule of the common law courts that no landowner is responsible for the harm caused by natural forces originating on his property. As Prosser writes, a landowner

> is under no affirmative duty to remedy conditions of purely natural origin upon his land, although they may be highly dangerous or inconvenient to his neighbors . . . . Thus it has been held that the landowner is not liable for the existence of a foul swamp, for falling rocks, for the spread of weeds or thistles growing on his land, for harm done by indigenous animals, or for the normal, natural flow of surface water.[71]

In sum, no one has a right to clean air, but one does have a right to not have his air invaded by pollutants generated by an aggressor.

Air Pollution: Law and Regulation

We have established that everyone may do as he wishes provided he does not initiate an overt act of aggression against the person or property of anyone else. Anyone who initiates such aggression must be strictly liable for damages against the victim, even if the action is "reasonable" or accidental. Finally, such aggression may take the form of pollution of someone else's air, including his owned effective airspace, injury against his person, or a nuisance interfering with his possession or use of his land.

This is the case, *provided that:* (a) the polluter has not previously established a homestead easement; (b) while visible pollutants or noxious odors are per se aggression, in the case of invisible and insensible pollutants the plaintiff must prove actual harm; (c) the burden of proof of such aggression rests upon the plaintiff; (d) the plaintiff must prove strict causality from the actions of the defendant to the victimization of the plaintiff; (e) the plaintiff must prove such causality and aggression beyond a reasonable doubt; and (f) there is no vicarious liability, but only liability for those who actually commit the deed.

With these principles in mind, let us consider the current state of

[71] Prosser, *Law of Torts,* p. 354.

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air pollution law. Even the current shift from negligence and "reasonable" actions to strict liability has by no means satisfied the chronic special pleaders for environmental plaintiffs. As Paul Downing says, "Currently, a party who has been damaged by air pollution must prove in court that emitter A damaged him. He must establish that he was damaged and emitter A did it, and not emitter B. This is almost always an impossible task."[72] If true, then we must assent uncomplainingly. After all, proof of causality is a basic principle of civilized law, let alone of libertarian legal theory.

Similarly, James Krier concedes that even if requirement to prove intent or unreasonable conduct or negligence is replaced by strict liability, there is still the problem of *proving the causal link* between the wrongful conduct and the injury. Krier complains that "cause and effect must still be established."[73] He wants to "make systematic reallocation of the burden of proof," i.e., take the burden off the plaintiff, where it clearly belongs. Are defendants now to be guilty until they can prove themselves innocent?

The prevalence of multiple sources of pollution emissions is a problem. How are we to blame emitter A if there are other emitters or if there are natural sources of emission? Whatever the answer, it must not come at the expense of throwing out proper standards of proof, and conferring unjust special privileges on plaintiffs and special burdens on defendants.[74]

Similar problems of proof are faced by plaintiffs in nuclear radiation cases. As Jeffrey Bodie writes, "In general the courts seem to require a high degree of causation in radiation cases which frequently is impossible to satisfy given the limited extent of medical knowledge in this field."[75] But as we have seen above, it is precisely this "limited extent of knowledge" that makes it imperative to safeguard defendants from lax canons of proof.

There are, of course, innumerable statutes and regulations that create illegality besides the torts dealt with in common-law courts.[76] We have not dealt with laws such as the Clean Air Act of 1970 or regulations for a simple reason: None of them can be permissible

[72] Paul B. Downing, "An Introduction to the Problem of Air Quality," in Downing, ed., *Air Pollution and the Social Sciences* (New York: Praeger Pubs., 1971), p. 13.
[73] James E. Krier, "Air Pollution and Legal Institutions: An Overview," in Downing, *Air Pollution,* pp. 107-108.
[74] See section entitled "Joint Torts and Joint Victims" for a discussion of joint tortfeasors, multiple torts, and class action suits.
[75] Jeffrey C. Bodie, "The Irradiated Plaintiff: Tort Recovery Outside Price-Anderson," *Environmental Law* 6 (Spring 1976): 868.
[76] With respect to air pollution regulations, see Landau, "Who Owns the Air?," pp. 575-600.

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under libertarian legal theory. In libertarian theory, it is only permissible to proceed coercively against someone if he is a proven aggressor, and that aggression must be proven in court (or in arbitration) beyond a reasonable doubt. Any statute or administrative regulation necessarily makes actions illegal that are not overt initiations of crimes or torts according to libertarian theory. Every statute or administrative rule is therefore illegitimate and itself invasive and a criminal interference with the property rights of noncriminals.

Suppose, for example, that A builds a building, sells it to B, and it promptly collapses. A should be liable for injuring B's person and property and the liability should be proven in court, which can then enforce the proper measures of restitution and punishment. But if the legislature has imposed building codes and inspections in the name of "safety," innocent builders (i.e., those whose buildings have not collapsed) are subjected to unnecessary and often costly rules, with no necessity by government to prove crime or damage. They have committed no tort or crime, but are subject to rules, often only distantly related to safety, *in advance* by tyrannical governmental bodies. Yet, a builder who meets administrative inspection and safety codes and then has a building of his collapse, is often let off the hook by the courts. After all, has he not obeyed all the safety rules of the government, and hasn't he thereby received the advance *imprimatur* of the authorities?[77]

The only civil or criminal system consonant with libertarian legal principles is to have judges (and/or juries and arbitrators) pursuing charges of torts by plaintiffs made against defendants.

It should be underlined that in libertarian legal theory, only the victim (or his heirs and assigns) can legitimately press suit against alleged transgressors against his person or property. District attorneys or other government officials should not be allowed to press charges against the wishes of the victim, in the name of "crimes" against such dubious or nonexistent entities as "society" or the "state." If, for example, the victim of an assault or theft is a pacifist and refuses to press charges against the criminal, no one else should have the right to do so against his wishes. For just as a creditor has the right to "forgive" an unpaid debt voluntarily, so a victim, whether on pacifist grounds or because the criminal has bought his way out of a suit[78] or any other reason, has the right to

[77] For an excellent discussion of judicial as opposed to statutory or administrative remedies for adulteration of products, see Wordsworth Donisthorpe, *Law in a Free Society* (London: MacMillan, 1895), pp. 132-158.

[78] Criminals should have the right to buy off a suit or enforcement by the victim, just

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"forgive" the crime so that the crime is thereby annulled.

Critics of automobile emissions will be disturbed by the absence of government regulation, in view of the difficulties of proving harm to victims from individual automobiles.[79] But, as we have stressed, utilitarian considerations must always be subordinate to the requirements of justice. Those worried about auto emissions are in even worse shape in the tort law courts, because libertarian principle also requires a return to the now much scorned 19th century rule of *privity*.

The privity rule, which applies largely to the field of products liability, states that the buyer of a defective product can only sue the person with whom he had a contract.[80] If the consumer buys a watch from a retailer, and the watch does not work, it should only be the retailer whom he can sue, since it was the retailer who transferred ownership of the watch in exchange for the consumer's money. The consumer, in contrast to modern rulings, should not be able to sue the manufacturer, with whom he had no dealings. It was the retailer who, by selling the product, gave an implied warranty that the product would not be defective. And similarly, the retailer should only be able to sue the wholesaler for the defective product, the wholesaler the jobber, and finally the manufacturer.[81]

In the same way, the privity rule should be applied to auto emissions. The guilty polluter should be each individual car owner and not the automobile manufacturer, who is not responsible for the actual tort and the actual emission. (For all the manufacturer knows, for example, the car might only be used in some unpopulated area or used mainly for aesthetic contemplation by the car owner.) As in the product liability cases, the only real justification for suing the manufacturer rather than the retailer is simply convenience and deep pockets, with the manufacturer presumably being wealthier than the retailer.

While the situation for plaintiffs against auto emissions might seem hopeless under libertarian law, there is a partial way out. In a libertarian society, the roads would be privately owned. This means that the auto emissions would be emanating from the road of

as they should have the right to buy out an injunction from a victim after it has been issued. For an excellent article on the latter question, see Thompson, "Injunction Negotiations," pp. 1563-1595.

[79] See section entitled "Joint Torts and Joint Victims."

[80] For hostile accounts of privity and a discussion of implied warranty, see Richard A. Epstein, *Modern Products Liability Law* (Westport, Conn.: Quorum Books, 1980), pp. 9-34; and Prosser, *Law of Torts*, pp. 641ff.

[81] Some of the practical difficulties involved in such suits could be overcome by joinder of the various plaintiffs. See section entitled "Joint Torts and Joint Victims."

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the road owner into the lungs or airspace of other citizens, so that the road owner would be liable for pollution damage to the surrounding inhabitants. Suing the road owner is much more feasible than suing each individual car owner for the minute amount of pollutants he might be responsible for. In order to protect himself from these suits, or even from possible injunctions, the road owner would then have the economic incentive to issue antipollution regulations for all cars that wish to ride on his road. Once again, as in other cases of the "tragedy of the commons," private ownership of the resource can solve many "externality" problems.[82]

Collapsing Crime Into Tort

But if there is no such entity as society or the state, or no one except the victim that should have any standing as a prosecutor or plaintiff, this means that the entire structure of criminal law must be dispensed with, and that we are left with tort law, where the victim indeed presses charges against the aggressor.[83] However, there is no reason why parts of the law that are now the province of criminal law cannot be grafted onto an enlarged law of torts. For example, restitution to the victim is now considered the province of tort law, whereas punishment is the realm of criminal law.[84] Yet, punitive damages for intentional torts (as opposed to accidents) now generally are awarded in tort law. It is therefore conceivable that more severe punishments, such as imprisonment, forced labor to repay the victim, or transportation, could be grafted onto tort law as well.[85]

One cogent argument against any proposal to collapse criminal into tort law is that, in the reasoning against allowing punitive damages in tort cases, they are "fixed only by the caprice of the jury

[82] On the "tragedy of the commons" and private ownership, see, for example, Garrett Hardin, "The Tragedy of the Commons," *Science* 162 (1968): 1243-1248; Robert J. Smith, "Resolving the Tragedy of the Commons by Creating Private Property Rights in Wildlife," *Cato Journal* 1 (Fall 1981): 439-468.

[83] Notes Prosser: "A crime is an offense against the public at large, for which the state, as the representative of the public, will bring proceedings in the form of a criminal prosecution. The purpose of such a proceeding is to protect and vindicate the interests of the public as a whole. . . . A criminal prosecution is not concerned in any way with compensation of the injured individual against whom the crime is committed. . ." Prosser, *Law of Torts*, p. 7.

[84] For an illuminating discussion of the roots of the modern split between criminal and tort law, with the former as pursuing crimes against the "king's peace," see Barnett, "Restitution," pp. 350-354.

[85] On punitive damages in tort law, see Prosser, *Law of Torts*, pp. 9ff. This is not the place to set forth a theory of punishment. Theories of punishment among libertarian

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and imposed without the usual safeguards thrown about criminal procedure, such as proof of guilt beyond a reasonable doubt [and] the privilege against self-incrimination . . ."[86] But, as argued above, standards such as proof beyond a reasonable doubt should be applied to tort law cases as well.[87]

Professor Epstein, in attempting to preserve a separate realm for criminal law as against a proposed collapse into tort law, rests much of his case on the law of attempts. In criminal law, an attempted crime that for some reason fails and results in no damage or invasion of the rights of the victim, is still a crime and can be prosecuted. And yet, Epstein charges, such an attempted crime would not be an invasion of rights and therefore could not be a tort and could not be prosecuted under tort law.[88]

Randy Barnett's rebuttal, however, is conclusive. Barnett points out, first, that most unsuccessful attempts at invasion result nevertheless in "successful" though lesser invasions of person or property, and would therefore be prosecutable under tort law. "For example, attempted murder is usually an aggravated assault and battery, attempted armed robbery is usually an assault, attempted car theft or burglary is usually a trespass."[89] Secondly, even if the attempted crime created no invasion of property per se, if the attempted battery or murder became *known* to the victim, the resulting creation of fear in the victim would be prosecutable as an assault. So the attempted criminal (or tortfeasor) could not get away unscratched.

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philosophers and legal theorists range from avoiding any coercive sanctions whatever to restitution only, restitution plus proportional punishment, and allowing unlimited punishment for any crime whatever.

For my own view on proportional punishment, see Murray N. Rothbard, "Punishment and Proportionality," in Barnett and Hagel, *Assessing the Criminal,* pp. 259-270. On the concept of transporting criminals, see Leonard P. Liggio, "The Transportation of Criminals: A Brief Politico-Economic History," in ibid., pp. 273-294.

[86] Ibid., p. 11. Also see Epstein, *Cases on Torts,* p. 906.

[87] As would the privilege against self-incrimination. In fact, the ban against compulsory testimony should not only be extended to tort cases, it should be widened to include *all* compulsory testimony, against others as well as against oneself.

[88] Richard A. Epstein, "Crime and Tort: Old Wine in Old Bottles," in Barnett and Hagel, *Assessing the Criminal,* pp. 231-257.

[89] Barnett, "Restitution," p. 376. Barnett adds: "In this way the law of attempt is actually a form of double counting whose principal function is to enable the police and prosecutor to overcharge a crime for purposes of a later plea negotiation. Furthermore, some categories of attempt, such as conspiracy laws and possessory laws — e.g., possession of burglarious instruments — are short-cuts for prosecutors unable or unwilling to prove the actual crime and are a constant source of selective, repressive prosecutions." Ibid. We might add that the latter laws would be illegitimate under libertarian law.

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Therefore, the only attempted invasion that could not be prosecuted under the law of torts would be one that *no one ever knew anything about.* But if no one knows about it, it cannot be prosecuted, under any law.[90]

Furthermore, as Barnett concludes, potential victims would not be prevented under libertarian law from defending themselves from attempts at crime. As Barnett says, it is justifiable for a victim or his agents to repel an overt act that has been initiated against him, and that in fact is what an attempt at crime is all about.[91]

Joint Torts and Joint Victims

So far in discussing invasions of person or property, we have confined ourselves to single aggressors and single victims, of the "A hit B" or "A damaged B" variety. But actual air pollution cases often have multiple alleged aggressors and multiple victims. On what principles may they be prosecuted or convicted?

When more than one aggressor has contributed to a tort, it is generally more convenient for the plaintiffs to join the defendants together in one suit ("joinder"). Convenience, however, should not be allowed to override principle or rights, and in our view the original common law rule of joinder was correct: Defendants can be compulsorily joined *only* when all the parties acted in concert in a joint tortious enterprise.

In the case of truly joint torts, it also makes sense to have each of the joint aggressors equally liable for the entire amount of the damages. If it were otherwise, each criminal could dilute his own liability in advance by simply adding more criminals to their joint enterprise. Hence, since the action of all the aggressors was in concert, the tort was truly joint, so that

> "all coming to do an unlawful act, and of one party, the act of one is the act of the same party being present." Each was therefore liable for the entire damage done, although one might have battered the plaintiff, while another imprisoned him, and a third

[90] According to Barnett: "The only type of unsuccessful attempt that would escape liability [under tort law] would be the case of someone who unsuccessfully tried to commit a crime without otherwise violating anyone's rights and *without anyone knowing about it.* . . . In any case, no system governed by any principle can prosecute acts that no one knows about." Ibid., pp. 376-377. Professor Ronald Hamowy of the University of Alberta should also be mentioned as contributing significantly to this solution to the problem.

[91] One can agree with Barnett here without adopting his own pure-restitution-without-punishment variant of tort law. In our own view, elements of criminal law such as punishment could readily be incorporated into a reconstructed tort law.

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> stole his silver buttons. All might be joined as defendants in the same action at law. . . .[92]

Unfortunately, for purposes of convenience, the joinder rule has been weakened, and the courts in many cases have permitted plaintiffs to compel joinder of defendants even in cases where torts are committed separately and not in concert.[93] The confusion in joinder for both joint and separate torts has caused many courts to apply the full or "entire" liability rule to each aggressor. In the case of separate torts impinging upon a victim, this makes little sense. Here the rule should always be what it has traditionally been in nuisance cases, that the courts apportion damage in accordance with the separate causal actions contributed by each defendant.

Air pollution cases generally are those of separate torts impinging upon victims; therefore, there should be no compulsory joinder and damages should be apportioned in accordance with the separate causal factors involved. As Prosser writes:

> Nuisance cases, in particular, have tended to result in apportionment of the damages, largely because the interference with the plaintiff's use of his land has tended to be severable in terms of quantity, percentage, or degree. Thus defendants who independently pollute the same stream or who flood the plaintiff's land from separate sources, are liable only severally for the damages individually caused, and the same is true as to nuisance due to noise, or pollution of the air.[94]

But because the injuries are multiple and separate, it is then up to the plaintiffs to show a rational and provable basis for apportioning the damage among the various defendants and causative factors. If this rule is properly and strictly adhered to, and proof is beyond a reasonable doubt, the plaintiffs in air pollution cases generally will be able to accomplish very little. To counter this, environmental lawyers have proposed a weakening of the very basis of our legal system by shifting the burden of proof for detailed allocation of damages from the plaintiffs to the various defendants.[95]

Thus, compulsory joinder of defendants may proceed on the original common law rule only when the defendants have allegedly committed a truly joint tort, in concerted action. Otherwise, defendants may insist on separate court actions.

What about joinder of several *plaintiffs* against one or more defen-

[92] Prosser, *Law of Torts,* p. 291. Also see, ibid., pp. 293ff.
[93] In this situation, joinder is compulsory upon the defendants, even though the plaintiffs may choose between joinder and separate actions.
[94] Prosser, *Law of Torts,* pp. 317-318.
[95] See Katz, "Function of Tort Liability," pp. 619-620.

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dants? When may that take place? This problem is highly relevant to air pollution cases, where there are usually many plaintiffs proceeding against one or more defendants.

In the early common law, the rules were rigorous on limiting permissible joinder of plaintiffs to cases where all causes in action had to affect all the parties joined. This has now been liberalized to permit joint action by plaintiffs where the joint action arises out of the same transaction or series of transactions, and where there is at least one question of law of fact common to all plaintiffs. This appears to be a legitimate liberalization of when plaintiffs shall be allowed voluntary joinder.[96]

While permissive joinder of plaintiffs in this sense is perfectly legitimate, this is not the case for "class action" suits, where the outcome of the suit is binding even upon those members of the alleged class of victims who did not participate in the suit. It seems the height of presumption for plaintiffs to join in a common suit and to press a "class action" suit, in which even those other alleged victims who never heard of or in some way did not consent to a suit are bound by the result. The only plaintiffs who should be affected by a suit are those who voluntarily join. Thus, it would not be permissible for 50 residents of Los Angeles to file a pollution suit on behalf of the class of "all citizens of Los Angeles," without their knowledge or express consent. On the principle that only the victim and his heirs and assigns may press suit or use force on his behalf, class action suits binding on anyone except voluntary plaintiffs are impermissible.[97]

Unfortunately, while the 1938 Federal Rule of Civil Procedure 23 provided for at least one type of nonbinding class action, the "spurious class action," the revised 1966 rules make all class action suits binding upon the class as a whole, or rather on all those members of the class who do not specifically request exclusion. In an unprecedented step, voluntary action is now being assumed if *no* action is taken. The residents of Los Angeles, who might not even know about the suit in question, are required to take steps to exclude themselves from the suit, otherwise the decision will be binding upon them.[98] Furthermore, most states have followed the new

[96] However, a better course would be to require that common interests predominate over separate individual interests, as is now being required for class action suits. See the discussion of *City of San Jose* v. *Superior Court* below.

[97] The type of class action suit once known as "spurious class action," in which a judgment binds only those members actually before the court, was not actually a class action suit but a permissive joinder device. Fed. R. Civ. P. 23 (1938).

[98] The 1938 Rules provided that in some cases any class action must be of the

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federal rules for class action suits.

As in the case of voluntary joinder, the post-1966 class action must involve questions of law or fact common to their entire class. Fortunately, the courts have placed further limits on the use of class action. In most cases, all identifiable members of the class must be given individual notice of the suit, giving them at least an opportunity to opt out of the action; also, the class must be definitely identifiable, ascertainable, and manageable. Under this rule, the federal courts generally would not allow "all residents of the city of Los Angeles" to be party to a class action suit.[99] Thus, a suit allegedly on behalf of all residents of Los Angeles County (over seven million persons) to enjoin 293 companies from polluting the atmosphere was dismissed by the court "as unmanageable because of the number of parties (plaintiffs and defendants), the diversity of their interests, and the multiplicity of issues involved."[100]

Another sensible limitation placed on most class action suits is that common class interests in the suit must *predominate* over separate individual interests. Thus, a class suit will not be allowed where separate individual issues are "numerous and substantial," and therefore common issues do not predominate. In the case of *City of San Jose* v. *Superior Court* (1974), the court threw out a class action suit of landowners near an airport, suing for damages to their land resulting from airport noise, pollution, traffic, etc. Even though the airport affected each of the landowners, the court properly ruled that "the right of each landowner to recover for the harm to his land involved too many individual facts (e.g. proximity to flight paths, type of property, value, use, etc.)" to permit a class suit.[101]

Thus, class action suits should not be allowed except where every plaintiff actively and voluntarily joins and where common interests

spurious kind mentioned in the previous footnote. The revised 1966 Rules made all class action suits binding by eliminating the spurious action category. See Fed. R. Civ. P. 23 (1966).

[99] Fed. R. Civ. P. 23(a) (1966). On the question of whether individual notice to class manners is or is not mandatory, see Fed. R. Civ. P. 23(b)(1), Fed. R. Civ. P. 23(b)(2), Fed. R. Civ. P. 23(b)(3), Fed. R. Civ. P. 23(d)(2), Fed. R. Civ. P. 23(e), *Mattern* v. *Weinberger,* 519F.2d 150 (3d Cir. 1975), *Eisen* v. *Carlisle & Jacquelin,* 417 U.S. 156 (1974), *Cooper* v. *American Savings & Loan Association,* 55 Cal. App. 3d 274 (1976).

[100] The case was *Diamond* v. *General Motors Corp.* 20 Cal. App. 2d 374 (1971). On the other hand, some state court decisions, such as in California, have been highly favorable toward class action suits. The California court actually allowed a class action of one man against a defendant taxi company for alleged overcharges, on behalf of himself and several thousand unidentifiable customers of the company. *Dear* v. *Yellow Cab Co.,* 67 Cal. 2d 695 (1967).

[101] *City of San Jose* v. *Superior Court,* 12 Cal. 3d 447 (1974).

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predominate over separate and individual ones.[102]

How, then, have the recent class action rules been applied to the question of air pollution? Krier says with dismay that while the 1966 Federal Rule 23 is indeed more liberal than its predecessor in allowing class action, the U.S. Supreme Court has virtually nullified its impact by ruling that class members may aggregate individual claims for federal courts *only* when they share a common and undivided interest.[103] According to Krier, this cogent limitation rules out most class action suits in air pollution cases. He adds that while this restriction does not apply to state suits, these are often even less viable than federal class suits before the new rules. Krier complains, in an unconsciously humorous note, that some class action suits don't attract *any* plaintiffs at all.[104]

But the major problem of class action suits for the plaintiffs, Krier concedes, is the manageability and ascertainability rules for suits with a large number of plaintiffs in the class, citing in particular the *Diamond* v. *General Motors* case. But whereas Krier attributes the problem solely to the lack of competence and facilities judges possess to balance the various interests, he fails to realize the still larger problem of lack of identifiability and lack of clear proof of guilt and causality between defendant and plaintiff.

Conclusion

We have attempted to set forth a set of libertarian principles by which to gauge and reconstruct the law. We have concluded that everyone should be able to do what he likes, except if he commits an overt act of aggression against the person and property of another. Only this act should be illegal, and it should be pro-

[102] Epstein provides an interesting note on ways in which plaintiffs, in a purely libertarian way, were able to overcome the fact that neither joinder nor class action suits were permitted because of the extent and diversity of individual interests involved. The drug MER/29 was taken off the market in 1962, after which about 1,500 lawsuits were initiated against the drug company for damage. While the defendant successfully objected to a voluntary joinder, most of the attorneys voluntarily coordinated their activities through a central clearinghouse committee with fees for services assessed upon all lawyers in the group. Epstein reports that the lawyers who participated in the group were usually more successful in their respective suits than those who did not. Epstein, *Cases on Torts,* p. 274.

[103] In *Snyder* v. *Harris,* 394 U.S. 332 (1970). Krier, "Air Pollution."

[104] In short, what if they filed a pollution class-action suit and nobody came? Krier cites the case of *Riter* v. *Keokuk Electro-Metals Co.* 248 Iowa 710, 82 N.W. 2d 151 (1957). Krier, "Air Pollution," p. 217. Also see John Esposito, "Air and Water Pollution: What to Do While Waiting for Washington," *Harvard Civil Rights/Civil Liberties Law Review,* January 1970, p. 36.

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secutable only in the courts under tort law, with the victim or his heirs and assigns pressing the case against the alleged aggressor. Therefore, no statute or administrative ruling creating illegal actions should be permitted. And since any prosecution on behalf of "society" or the "state" is impermissible, the criminal law should be collapsed into a reconstituted tort law, incorporating punishment and part of the law of attempts.

The tortfeasor or criminal is to be strictly liable for his aggression, with no evasion of liability permissible on the basis of "negligence" or "reasonability" theories. However, the liability must be proven on the basis of strict causality of the defendant's action against the plaintiff, and it must be proven by the plaintiff beyond a reasonable doubt.

The aggressor and only the aggressor should be liable, and not the employer of an aggressor, provided, of course, that the tort was not committed at the direction of the employer. The current system of vicarious employer liability is a hangover from precapitalist master/serf relations and is basically an unjust method of finding deep pockets to plunder.

These principles should apply to all torts, including air pollution. Air pollution is a private nuisance generated from one person's landed property onto another and is an invasion of the airspace appurtenant to land and, often, of the person of the landowner. Basic to libertarian theory of property rights is the concept of homesteading, in which the first occupier and user of a resource thereby makes it his property. Therefore, where a "polluter" has come first to the pollution and has preceded the landowner in emitting air pollution or excessive noise onto empty land, he has thereby homesteaded a pollution or excessive noise easement. Such an easement becomes his legitimate property right rather than that of the later, adjacent landowner. Air pollution, then, is not a tort but only the ineluctable right of the polluter *if* he is simply acting on a homestead easement. But where there is no easement and air pollution is evident to the senses, pollution is a tort per se because it interferes with the possession and use of the property by its owner. But the invisible and insensible crossing of another's air boundary — say by radio waves or low-level radiation — cannot be considered aggression because it does not interfere with the owner's use or enjoyment of his person or property. Only if such a boundary crossing commits provable harm — according to principles of strict causability and beyond a reasonable doubt — can it be considered a tort and subject to liability and injunction.

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A joint tort, in which defendants are compelled to defend themselves jointly, should apply only if all acted in concert. Where their actions are separate, the suits must be separate as well, and the liability apportioned separately. Plaintiffs should be able to join their suits against a defendant only if their cases have a common element predominating over the separate and individual interests. Class action suits are impermissible beyond a voluntary joinder of plaintiffs because they presume to act for and bind class members who have not agreed to join in the suit.

Finally, we must renounce the common practice of writers on environmental law of acting as special pleaders for air pollution plaintiffs, lamenting whenever plaintiffs are not allowed to ride roughshod over defendants. The overriding factor in air pollution law, as in other parts of the law, should be libertarian and property rights principles rather than the convenience or special interests of one set of contestants.

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LEGAL ISSUES IN POLLUTION-ENGENDERED TORTS

Robert K. Best and James I. Collins

I. Introduction

The end of World War II marked the birth of the modern chemical industry. From that time synthetic rubbers, fibers, and complex organohalogens have been produced in large commercial quantities, such that each member of modern society is exposed to chemicals of exotic physiochemical activity. For years, direct exposure to high concentrations of such compounds has resulted in tort claims.

There is now growing concern that chronic, low-level exposure to these compounds is causing, at an increasing rate, harmful physiological responses. However, the causal link between these agents and their alleged harms is often uncertain. For example, some have argued that there is a growing epidemic of cancer,[1] while a recent study indicates that the incidence of cancer has decreased, if lung cancer, attributable to cigarette smoking, is not counted.[2]

This uncertainty has led to the loss of the "stable state."[3] That is, traditional conflict-resolving institutions are being strained by claims based on new abilities of the scientific communities to identify and predict that products and tools of modern life may harm the environment and ourselves. This article examines the ap-

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[1] Samuel S. Epstein, M.D., *The Politics of Cancer* (San Francisco: Sierra Club Books, 1978), p. 17.

[2] *Chemical and Engineering News* 17 August 1981, p. 32.

[3] Donald A. Schon, *Beyond the Stable State* (New York: Norton and Co., 1971), pp. 9-10.

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propriate limits of liability for harm and potential harm under the tort system of private rights resolution for harm arising from exposure to pollutants.[4]

Section II describes the social context and historical development of tort law. Section III outlines key features of four traditional theories of tort recovery to point out the doctrines affecting limitations on tort recoveries that are of particular importance to pollution tort litigation. Section IV addresses the stress on the tort system from the confusion of legal, medical, and scientific causation. Section V discusses the inflexibility of the tort system brought about by concepts of causation, burden of proof, and identification of the defendent in pollution tort cases. Finally, Section VI suggests a broad concept to introduce greater flexibility into the tort system in order to lessen the pressure for even greater government involvement in the regulation of pollution, and in the compensation for pollution injuries.

II. Social Context of Tort Law

"The life of the law has not been logic: it has been experience."
Oliver Wendell Holmes, Jr., 1881

"Conformance to reasonable expectations" is the key to the law's effectiveness because it is only in that way that litigants will accept legal remedies in lieu of private vengeance.[5] Such conformance is possible only when the law reflects "the felt necessities of the time, the pervading moral and political theories and even the prejudices which the judges share with their fellow citizens."[6] Two points are crucial here. First, expectations are mutable, especially in a free society. Second, "prejudice" has a negative connotation, especially in connection with the judicial process, because it signifies a deviation from the goal of "objective truth." But this "truth" is not objective in the sense of moral certainty; rather it is more akin to the vagaries of contemporary standards. Thus, Justice Benjamin N. Cordozo believed that "[m]y duty as judge may be to objectify the law, not my own aspirations and convictions and philosophies, but the aspirations and convictions and philosophies of the men and

[4]Here, "pollutant" refers to any substance, material, or energy form not normally present in the environment or not normally present in the concentration in question.
[5]William L. Prosser, *Law of Torts,* 4th ed. (St. Paul, Minn.: West Publishing Co., 1971), p. 492.
[6]O. Holmes, *The Common Law* (Cambridge: Harvard University Press, 1963), p. 5.

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women of my time."[7]

The law has responded to social change in three ways. First, it uses traditional legal doctrine and procedure to reach and justify particular results. Second, the legal system allocates official resources to determine what ought to be done and how. Third, the courts strive, as described above, to relate the perception of reality to contemporary standards, to identify some notion of cause and effect, and to achieve economy in realizing those values.[8] These responses are taken in balance with the desire for continuity of results. Thus, legal policy not only protects vested interests but promotes perceived social virtues, most notably the certainty of relationships.

Balancing these forces is intended to achieve decisions that are not only responsive to the needs of the litigants but also to those of society. However, such equilibrium is difficult when the popular perspective is ill-defined. Under such circumstances, the system appears to be unresponsive to the popular demand for redress of injury. This problem arises in the adjudication of factual disputes found in many pollution-based claims of injury because of the difficulty of establishing causation between the pollutant and the alleged injury, and the relatively new etiology and symptomatology of the harms of which plaintiff complains.

This uneasy relationship between science, technology, and the law is not new. It has been manifest in the historical development of tort principles. In fact, the impetus of tort law was the industrial revolution and its machines, and most notably the railroads, which substantially increased damage to property and persons.[9] The law shifted the cost of many of these injuries from the enterprises to the workers and the public. This was done by the development of legal doctrines, which altered the concepts of causation and procedure.

Proximate cause is a useful device in this regard because it enables the courts to limit liability where cause-in-fact is apparent. For example, in *Ryan* v. *New York Central Railroad Co.*[10] defendant railroad company negligently set a house on fire. Sparks emitted caused plaintiff's house to burn. The court, using proximate cause, found for the defendant, reasoning that "in a commercial

[7] Benjamin N. Cordozo, *The Nature of the Judicial Process* (New Haven: Yale University Press, 1955), p. 173.
[8] James W. Hurst, *Law and Social Process in United States History* (New York: DeCapo Publishing Co., 1972), pp. 20-21.
[9] B. Schwartz, *The Law of America* (New York: American Heritage Publishing Co., 1974), pp. 241-42.
[10] 35 N.Y. 210 (1866), 13 N.Y. Supp. 869.

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country, each man, to some extent, runs the hazard of his neighbors' conduct, and each, by insurance against such hazards, is enabled to obtain a reasonable security against loss."[11] In effect, the court refused to find the railroad liable because it was capable of causing too much damage.

Legal procedure can also limit liability. The statute of limitations, the period of time in which the cause of action must be brought, and the rules regarding the running and tolling of that period directly affect the viability of personal injury suits. Also, the court's determination of which party has the burden of proving the particular facts at issue and the standard of proof to be met are important devices for effectuating social policy.

These 19th-century concepts gradually gave way to more liberal rules of compensation. This liberalization began as the industries became more successful and as the number of uncompensated injured persons, widows, and orphans increased. Strict liability of *Rylands* v. *Fletcher*[12] began to be applied to a growing number of factual settings, most notably common carriers. The 19th-century "moral" aspect of fault analysis gave way to the more objective standard of reasonable behavior. Finally, courts became more aware of the growing popular resentment against limited liability. Jury verdicts reflected the popular view that people, not industry, ought to be protected financially against industrial hazards.

In order to understand the likely response of the judicial system to personal injuries arising from new technology, including the production of exotic new chemicals, we must distinguish contemporary technology from that of the 19th century. For our purposes, a primary means of distinguishing these technologies is by focusing on the kind of injuries each produced.

Injuries caused by 18th and 19th-century industrial tools usually involved immediate trauma to gross anatomical structure, e.g., crushed or severed limbs. The cause-in-fact link between the defendant's action and the plaintiff's harm was rarely at issue. Also, most jurors and judges were aware of the consequences of the harm sustained. There was communal empathy for the suffering of tort victims.

However, modern chemicals are suspected of causing physical injuries, such as cancer, and certain emotional dysfunctions having etiologies that are little understood by science or medicine. One of the most significant characteristics of the development of these

[11] Ibid. at 217, 13 N.Y. Supp. at 873.
[12] L.R. 3 H.L. 330 (1868).

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types of diseases is their latency, the time between exposure and expression of the disease. For example, a few types of cancer have a latency period of 20 to 30 years while some mutagenic diseases may take a generation or more to become evident. Moreover, chemicals suspected of causing such diseases often function at low concentrations, e.g., parts per billion, or perhaps a single molecule. In addition, pollution injuries, unlike common traumatic injuries, may be inflicted on many persons located far from the pollution source.

Particularly baffling is their unpredictability. If a heavy beam falls upon a worker, the injury will be much the same regardless of who is struck. Exposure to identical concentrations of a given pollutant, however, may produce reactions varying from no observable ailment to a life-threatening emergency.

These characteristics create unprecedented uncertainty, thereby challenging the ability of the judicial system to perform its traditional role of balancing the availability of compensation for individual injury against the social benefits of the injury-causing agent.

Particularly ponderable is whether the tort concepts of causation, both actual (scientific) and proximate (legal), can function effectively to achieve just results both for individuals injured and for society, where the identification and measurement of both the injury and the benefits are often illusive and imperfect.

This paper focuses on these questions.

III. Traditional Causes of Action

Nuisance

Nuisance actions are based upon the ancient maxim, *sic utere tuo ut alienium non laedas* — use your own property in such a manner as not to injure that of another.[13] Although many consider this to be "utterly useless as a legal maxim,"[14] it does reveal the amorphous character of the cause of action. It is just this ill-defined nature which has led to the popularity of nuisance in private litigation to obtain injunctive relief for the control of pollution. However, the potential for using nuisance to recover damages for exposure to pollutants is limited.

Nuisance refers to the interests invaded, not the damage or harm

[13] *Black's Law Dictionary*, 4th ed. rev. (St. Paul, Minn.: West Publishing Co., 1968), p. 1551.
[14] Ibid.

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inflicted.[15] A nuisance action exists where the plaintiff shows a "substantial" interference with his or her property interest by means of the defendant's "unreasonable" conduct.[16] An interference, physical or otherwise, is substantial if the defendant's action, taken in light of community standards, adversely affects the property interest or reasonable sensibilities of the plaintiff.

Community standards may make an activity a nuisance, although there is no foundation in scientific fact to support the fears and prejudices of that community. In the case of *Everett* v. *Paschall,*[17] a private nuisance action was brought in which plaintiff alleged that defendants' sanitarium, for use by persons having pulmonary tuberculosis, decreased the value of plaintiff's property. Defendants argued that as a scientific fact, the sanitarium presented no danger of infection and that this enterprise represented a great benefit to the community. The trial court found these allegations to be true and refused to grant an injunction against the sanitarium. The appellate court agreed with the factual findings of the lower court, but reversed, stating:

> [W]e question our right to say that a fear is unfounded or unreasonable, when it is shared by the whole public to such an extent that property values are diminished. The question is, not whether the fear is founded in science, but whether it exists; not whether it is imaginary, but whether it is real; in that it affects the movements and conduct of men. Such fears are actual, and must be recognized by the courts as other emotions of the human mind.[18]

The appeals court stated further that "the theories and dogmas of scientific men, though provable by scientific reference, cannot be held to be controlling unless shared by the people generally."[19]

Thus, a nuisance action may be well founded even though it is based on mental attitudes or popular reactions that have no basis in scientific fact.[20]

[15] See Prosser, p. 577.

[16] The law of nuisance is divided into two parts, public and private. A public nuisance is an act or omission interfering with an interest common to the general public rather than peculiar to the individual. One has a cause of action here only if he or she has suffered damage peculiar in kind, not just degree, to himself or herself. A private nuisance requires interference with plaintiff's use and enjoyment of his or her land. If a private nuisance is found, consequential damages to the possessor's person or property may be awarded.

[17] 61 Wash. 47, 111 P. 879 (1910).

[18] Ibid.

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Courts universally require that interference with the particular protected interest be not only substantial, but also unreasonable. However, courts are divided as to the tests for "unreasonableness." The majority of the courts follow a balancing approach in which "the law must make the best arrangement it can between the contending parties, with a view of preserving to each one the largest measure of liberty possible. . . ."[21] The balance focuses mainly on the parties before the court. Thus, an individual plaintiff seeking recovery for injury resulting from large-scale pollution faces a difficult barrier in attempting to sway the balance to his behalf.

The minority position rejects the balancing doctrine and argues that "every substantial, material right of person or property is entitled to protection against all the world . . . [i]f the smaller interests must yield to the larger, all small property rights, . . . would sooner or later be absorbed by the large, more powerful few."[22]

Under this rationale, the defendant's activity is balanced against the normative principle of the sanctity of personal and private rights. However, courts have also indicated that in striking the balance between the competing property interests, the relative importance assigned property rights may vary from generation to generation.[23]

The use of a nuisance cause of action to recover damages for a pollution injury reduces the emphasis on causation. The focus of this tort is not on the culpability of defendant, but the occurrence of pollution. The question of whether the nuisance once proven caused an alleged personal injury still exists, but it is a matter of secondary focus — a question of "consequential" damages. However, the viability of a nuisance suit for the recovery of personal injury damages in pollution cases is limited by at least four considerations.

[19] Ibid. at 49; 111 P. at 881.

[20] This willingness to restrict activity without a scientific showing of danger also occurs in coercive government regulation. For example, when the California Assembly Health Committee (Chairman Art Torres) recently considered whether the state should regulate DNA recombinant research, Assemblyman Herschel Rosenthal stated, "We have a responsibility to allay people's fears, which the scientific community has done very little to allay. [New state] guidelines may not be necessary in terms of what you [science and industry] are doing but [may be required] in terms of people's perceptions . . . ." *Sacramento Bee,* 12 December 1981, p. E1.

[21] *Madison* v. *Duck Town Sulphur, Copper and Iron Company,* 113 Tenn 331, 366, 83 S.W. 658, 666 (1904).

[22] *Hulbert* v. *California Portland Cement Company,* 161 Cal. 239, 251, 118 P. 928, 933 (1911).

[23] *Antonik* v. *Chamberlain,* 81 Ohio App. 465, 475-76, 78 N.E.2d 752, 759 (1948).

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First, there is no concept of a private nuisance to the person as an individual separate from the ownership or occupancy of land.[24] The need to establish a property right in the polluted area can be a significant barrier.

Second, pollution cases are likely to be classified as public nuisances rather than private nuisances because of the usually wide distribution of the pollutants. If it is considered to be public rather than private, the plaintiff must demonstrate that he or she has or will suffer some special injury not shared with the general public. As long as the courts require the special injury to be different in the kind of injury, not just in the degree of injury, the widespread health effects of most pollution make the nuisance action less viable.

Third, plaintiff may have to overcome the problem of showing that the polluter has not, through the passage of time, obtained prescriptive rights with respect to the polluting activity. For example, in *Hulbert* the court found that the statute of limitations had run and thereby "the defendant had acquired a prescriptive right to manufacture the maximum quantity of cement produced annually by that factory."[25]

Fourth, in light of the rapidly expanding urban population, plaintiff's nuisance suit may be inhibited by the doctrine referred to as "coming to the nuisance." Some courts use this doctrine to block recovery by plaintiffs who voluntarily place themselves in contact with the pollution.[26] However, "[t]he prevailing rule is that in the absence of a prescriptive right the defendant cannot condemn the surrounding premises to endure the nuisance, and that the purchaser is entitled to the reasonable use and enjoyment of his land to the same extent as any other owner."[27] However, priority of occupation may influence the "unreasonableness" of the defendant's activity.

Trespass

Trespass, like nuisance, has had limited success in pollution cases even though it has certain procedural advantages. Depending upon whether or not the jurisdiction in question maintains a distinction between trespass and trespass on a case, the burden and necessity of proving damages may be lessened. Trespass actions also benefit

[24] See Footnote 16.
[25] *Hulbert,* 161 Cal. at 244, 118 P. at 930.
[26] 379 Pa. 441, 109 A.2d 310 (1954).
[27] See Prosser, p. 611.

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from having a longer period for statute of limitations. Furthermore, the attendant difficulties of balancing the equities and the questions of the defense of coming to the nuisance are avoided.

Trespass is "any intrusion which invades the possessor's protected interest in exclusive possession."[28] At early common law one could be held strictly liable for any invasion of such an interest. However, the existing rule, as embodied in the *Restatement (Second) of Torts,* provides that liability in trespass exists only when defendant invades plaintiff's exclusive right of possession by engaging in an abnormally dangerous activity or intentionally or negligently entering the land of another.[29] However, where the invasion is intentional the trespasser will be held liable whether or not he or she caused harm.[30] New York alone appears to embrace strict liability in trespass where defendant intended to do the act done, but not necessarily the consequences.[31] However, where defendant is a polluter, this lack of strict liability may not hinder the viability of a trespass action. An intentional act on the part of defendant could be asserted in that the release of a pollutant should be known to defendant. Thus, the deposition upon the land or person of another would be substantially likely. If defendant did not know of the release, plaintiff could argue that defendant was negligent in not knowing.[32] The injured party could also assert that defendant had engaged in an ultra-hazardous activity.[33]

Pollution cases often present facts that blur the distinction between trespass and nuisance. Generally, trespass is considered to be an invasion of plaintiff's interests in the exclusive possession of his land, whereas nuisance is an interference with plaintiff's use and enjoyment of his possessory interest.[34] In part, this distinction

[28] *Martin* v. *Reynolds Metals Company,* 221 Or. 86, 94, 342 P.2d 790, 794 (1959), *cert. denied,* 362 U.S. 918 (1960).

[29] *Restatement (Second) of Torts* §166 (1965).

[30] Ibid. at §166. "Intent" denotes that the actor desires to cause the consequences of his act as opposed to intending the act done. However, where the actor knows that the consequences are certain, or substantially certain, one is treated as if he or she, in fact, desired the results. If the consequences are less than substantially certain, the acts are termed reckless, and where they create a mere risk that the results will follow, the defendant's acts are characterized as ordinary negligence. *Restatement (Second) of Torts* §8A, comments (a) and (b).

[31] *Phillips* v. *Sun Oil Co.,* 307 N.Y. 328, 331, 121 N.E.2d 249, 250-51 (1954); see also *Wood* v. *United Airlines,* 32 Misc. 2d 955, 223 N.Y.S.2d 692 (1962).

[32] See this article, Section III, p. 111.

[33] See this article, Section III, p. 113.

[34] For a different conceptualization, see M. Rothbard, "Law, Property Rights, and Air Pollution" in *Cato Journal* 2 (Spring 1982), pp. 81-82.

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arose from the court's attempt to determine whether some direct physical invasion of a plaintiff's property had occurred. Here, the impact of science upon law is clear. Through the development of modern scientific detecting methods, the courts are now able to detect the physical invasion of microscopic particles. Thus, trespass may be found "whether that intrusion is by visible or invisible pieces of matter or by energy which can be measured only by the mathematical language of the physicist."[35] Through the application of this rationale, the use of trespass may increase.

Confusion between these two forms of action exists also because, contrary to popular belief, balancing of interests occurs in trespass as in nuisance. When a continuing trespass is at issue, for example, where defendant mistakenly builds a structure upon plaintiff's land, the court will decide whether it is better to have the structure removed by defendant or to force plaintiff to sell that portion of the property upon which the structure is located. Second, the prohibition against balancing of interests "does not mean that a weighing process does not take place when a court decides whether a particular kind of intrusion is of such a nature that it should be classified as a trespass."[36] That is, "the tort of trespass is composed of components which include the character of the defendant's conduct in causing an intrusion and the character of the harm visited upon the plaintiff in interfering with his interest in the exclusive possession of the premises."[37] Thus, the court could find by examining defendant's conduct in light of plaintiff's interest that the possessory interest invaded is de minimis.

Throughout the evolution of the law, changing social mores and perspectives have altered the identity of those interests that the legal system finds of such significance that strict rules of liability are developed to protect them. From early common law, the rules of trespass were intended to prevent bloodshed and community disintegration. Infringement upon land of another was just such a disruptive character because of the emotional turmoil it would cause. This basis of trespass law was expressly recognized in the *Martin* case where Justice O'Connell stated, "[p]robably the most important factor which describes the nature of the interest protected under the law of trespass is nothing more than a feeling which a possessor has with respect to the land which he holds."[38]

[35] *Martin*, 221 Or. at 94, 342 P.2d at 794.
[36] Ibid. at 98, 342 P.2d at 796.
[37] Ibid. at 98, 342 P.2d at 795.
[38] Ibid. at 100, 342 P.2d at 796.

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As the legal system faces a changing social climate brought about in part by the introduction of exotic chemicals, the question arises whether there may be such emotionally-charged personal interests or rights, separate from property, that the traditional strict rules of trespass should be applied to protect them.

Negligence

Negligence is a third major legal theory for the recovery of personal injury damages from pollution cases[39] and the theory most commonly employed.[40]

There are two major advantages of a negligence action. The first is the greater likelihood of obtaining punitive damages.[41] Second, generally in a negligence action the statute of limitations is tolled until plaintiff has discovered, or should have discovered, his or her injury. For example, in *Ruth* v. *Dight*[42] the court held the statute of limitations was tolled for 23 years, where defendant doctor had caused a sponge to be left in plaintiff's body for that period of time. A New York court decision recently followed a contrary rule in *Steinhordt* v. *Johns Manville Corporation,* 78 A.D. 2d 557 (1980); *upheld in* 50 L.W. 2280 (October 1981). There, plaintiff claimed that the deceased had died as a result of his exposure to asbestos during his 26 years at work. The court held that claims based on breach of warranty, negligence, and products liability were barred by the statute of limitations. The court ruled that the statutory period of limitation begins to run from the time when liability for wrong has arisen even though the injured party may be ignorant of the existence of the wrong or injury.[43]

There are four basic elements of any negligence action: A duty or obligation recognized by law requiring conformance to a particular standard of behavior, a breach of that standard, a causal connection between defendant's action or omission and plaintiff's injury, and actual loss or damage to a legally protectable interest.[44] This section briefly describes the impact of the elements of duty and standard of

[39] For a condemnation of negligence as a form of action, see Richard A. Epstein, *A Theory of Strict Liability: Toward a Reformulation of Tort Law* (Washington, D.C.: Cato Institute, 1980). See also, idem, "The Principles of Environmental Protection: The Case of Superfund" in *CATO Journal* 2 (Spring 1982), pp. 9-38.

[40] See Rothbard, pp. 81-82.

[41] See Prosser, pp. 9-10.

[42] 75 Wash. 2d 660, 453 P.2d 631 (1969).

[43] See *Schmidt* v. *Merchants Desp. Transp. Co.,* 270 N.Y. 287, 300 (1936); see also *Schwartz* v. *Heyden Newport Chemical Corp.,* 12 N.Y. 2d 212 (1963).

[44] See Prosser, p. 143.

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care. Causation and harm are discussed in Section IV.

The existence of both duty and the requisite standard of care depend upon the risk of injury which the particular activity in question involves. A risk is either reasonable (not actionable) or unreasonable (actionable). Generally, courts determine reasonableness of defendant's conduct by examining the possibility and gravity of the harm involved discounted by the utility of defendant's activity in light of possible alternatives which defendant faced.[45] This balancing of interests can have a significant impact on pollution torts. For example, in situations involving chemicals of unknown physiological activity, i.e., having only a speculative risk of harm and of unique economic importance, the courts will have difficulties finding a violation of an appropriate standard of care. "In determining the duty of care the law imposed upon the defendant, it is to be borne in mind that the ordinary care which the law requires of such a defendant is measured in part by the defendant's knowledge of potential dangers."[46]

Thus, in determining the standard of conduct to which defendant must conform, the court, as in nuisance cases, must balance the social utility of defendant's activity with the risk of harm presented.[47]

However, an element of a fixed standard of care runs through this balancing. "[W]hat ought to be done is fixed by a standard of reasonable prudence, whether it usually is complied with or not."[48] In pollution-engendered negligence actions defendants can be expected to make a major issue of the standard of care unless a clear mistake has been made. For example, persons claiming injury from acidic fumes emitted from a plant during normal operations on a normal day would face a severe standard of care issue. On the other hand, a plaintiff allegedly injured from improper operation of the plant under exceptional weather conditions may find no issue at all.[49]

Strict Liability

The notoriety of the last few years given to concepts of strict liability through "product liability" court decisions has raised the question of whether plaintiffs asserting a pollution-based tort claim

[45] See Prosser, pp. 145-46.
[46] *Reynolds Metals* v. *Yturbide Company*, 258 F.2d 321, 327 (9th Cir. 1958).
[47] See Prosser, p. 149.
[48] *Texas & Pacific Railway Company* v. *Behymer*, 189 U.S. 468 (1902), per Holmes, J.
[49] *Hagy* v. *Allied Chemical Co.*, 122 Cal. App. 2d 361, 265 P.2d 86 (1954).

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might find the same advantage in a strict liability theory as have plaintiffs in consumer tort actions. It appears unlikely that this will occur.[50] Strict liability in tort is based upon the theory that one who realizes profit from the hazards of his or her activity assumes the attending risk and may be held liable for any invasion of the person or property of another, notwithstanding that he or she may be free from all negligence or wrongdoing.[51] The social argument supporting this theory is that where defendant is acting for his own purposes and such activity involves inevitable loss to innocent victims, defendant is in the better position to administer the unusual risk of loss by passing it on to the public as a cost of producing the product or service in question.

The applicability of strict liability to cases follows two lines. One line involves products and is set forth in *Restatement (Second) of Torts*. There, a businessperson who sells a defective product, which is thereby unreasonably dangerous to the consumer or his property, is subject to liability for physical harm caused by the product if that product reaches the consumer without substantial alteration.[52] In California, the product need not be "unreasonably dangerous."[53] This line of cases is the "product liability" line, which has so greatly expanded in recent years.

The second line of strict liability cases applies to abnormally dangerous activities based on the case of *Rylands* v. *Fletcher*.[54] This line of cases has the most potential for application to pollution-based torts. It is also described by *Restatement (Second) of Torts*, which provides that:

> (1) One who carries on an abnormally dangerous activity is subject to liability for harm to the person, land or chattels of another resulting from the activity, although he has exercised the utmost care to prevent the harm.[55]

The following factors are provided by *Restatement* in determining whether an activity is abnormally dangerous: The probability and degree of risk, uncommon nature of risk, ability to eliminate the

[50] See Epstein, *Theory of Strict Liability*, for arguments favoring the replacement of negligence with strict liability.
[51] See Prosser, p. 495.
[52] *Restatement (Second) of Torts* §402(A).
[53] *Cronin* v. *J.B.E. Olson Corp.*, 8 Cal. 3d 121, 104 Cal. Rptr. 433 (1972); *Beech Aircraft Corp.* v. *Superior Court of Los Angeles County*, 61 Cal. App. 3d 501, 132 Cal. Rptr. 541 (1976).
[54] See Footnote 12.
[55] *Restatement (Second) of Torts* §519.
[56] Ibid. §520.

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risk, appropriateness of activity in the locale, and the activity's benefit to the community.[56]

This branch of the strict liability doctrine is limited, as under a negligence approach, by the requirement of a balance between risk of harm and social utility of the activity. "Even though the activity involves a serious risk of harm that cannot be eliminated with reasonable care . . . its value to the community may be such that the danger will not be regarded as an abnormal one."[57]

Thus, the use of strict liability in pollution torts will turn not only on the nature of the substance involved, but also on the circumstances of the alleged injury as well as the manner in which the competing interests are balanced by the forum in which the case is brought.

IV. Causation and Harm

"Fairness" requires that in order to hold defendant liable, a causal connection between defendant's allegedly tortious conduct and the harm of which plaintiff complains must be established. The sanguinity of this self-evident rule belies the philosophical and legal tumult generated when applying the concepts of causation and harm to pollution cases involving personal injuries.

Causation

1. Reasons for Causal Disharmony

The agitation over causation stems from three basic sources: First, the conceptual and language differences among the three disciplines that are usually involved in litigating a pollution tort case — science, medicine, and law; second, the courts' disfavor of statistical evidence; and third, the unknown etiology of many diseases pollution is suspected of causing.

Science functions "to establish general laws covering the behavior of empirical events or objects . . . and thereby to enable us to connect together our knowledge of the separately known events, and to make reliable predictions of events as yet unknown."[58] It does this by challenging mental constructs, called hypotheses, with experiments and then measuring the response of the particular parameter being investigated. The goal is "to discover what distin-

[57] Ibid. §520, comment (k).
[58] Richard R. Braithwaite, *Scientific Explanation* (Cambridge, Eng.: Cambridge University Press, 1955), p. 1.

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guishes a causal antecedent from a merely temporal antecedent"[59] so that one can assess the probability that the presence of "X" results or causes the presence of "Y." Thus, science is concerned with the logical problems of defining the conditions under which it is valid to infer the existence of "unobserved matters of fact on the basis of evidence concerning observed matters of fact."[60]

The validity of scientific conclusions rests on the fundamental assumption "that the scientist can identify all dependent and independent variables and hold constant all, or at least most, of the significant, independent variables."[61] Moreover, the utility of a hypothesis (such as DDT thins the eggshells of California condors)[62] depends on how closely the experimental parameters relate to the physical system in question. For issues involving the environmental impact of pollutants, it is often impossible, on moral grounds as well as scientific grounds, to design a completely reliable experimental model. This provides the lawyer with fertile ground for aggressive cross-examination of expert witnesses.

Medicine, like science, attempts to identify the single event that gives rise to a particular disease. One of the most challenging areas of modern medicine is determining the etiology of neoplastic diseases and other idiopathic diseases,[63] especially those that may be caused by environmental factors. There are two fundamental problems in this regard: The lack of physiological knowledge about these types of diseases and the growing belief that a complex interaction of multiple factors may be required to induce the observed pathological disorders. For these reasons, it will be difficult if not impossible for the lawyer to provide convincing and irrefutable medical evidence of causation where the personal injury is of this type.

Another problem exists for the lawyer when he or she deals with a physician as a source of expert information. The lawyer must be

[59] A. Pap, *Introduction to the Philosophy of Sciences* (New York: Free Press of Glencoe, 1962), p. 252.
[60] W. Salmon, *The Foundations of Scientific Inference* (Pittsburgh: University of Pittsburgh Press, 1966), p. 76.
[61] D.W. Large and P. Michie, "Proving that Strength of the British Navy Depends on the Number of Old Maids in England: A Comparison of Scientific Proof and Legal Proof," 11 *Environmental Law* (1981): 557, 565.
[62] F.E. Guthrie and J.J. Perry, *Introduction to Environmental Toxicology* (New York: Elsevica North Holland Ltd., 1980), p. 110.
[63] Idiopathic denotes a disease of unknown cause. *Stedman's Medical Dictionary,* 23d ed. (Baltimore, Md.: Williams and Wilkins Co., 1976), p. 689.

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aware that a doctor employs "habits of thought,"[64] which differ from those the attorney uses; this could cause difficulty in communication. Thus, in examining medical evidence, the lawyer must understand that the physician's training bends his thinking in a particular direction, distinct from the attorney's mind set.[65]

Contrary to both science and medicine, the legal system bifurcates causation into cause-in-fact and proximate or legal cause. Although commentators[66] have pointed out the difficulty in distinguishing these concepts as they are utilized by the courts, the consensus is that cause-in-fact is a phenomenon of the physical universe, i.e., akin to scientific cause, while proximate or legal cause is a question of social value.[67] Because the concept of causation in law is designed to aid the finder of fact in resolving conflict, the law must try to reflect the perception of people by safeguarding their reasonable expectations; a common-sense notion of causation must underlie legal analysis.[68] Thus, when the reasonable expectations of the populace are contrary to the notions of scientific or medical causation, a conflict arises between proof of legal causation and proof of causation acceptable for science and medicine.

2. Use of Scientific Causation in the Law

Traditionally, the difference between scientific cause and legal cause has been viewed as a product of proximate cause since there is no analogous concept in science or medicine.[69] Proximate or legal cause is defined as "[t]hat which, in a natural and continuous sequence, unbroken by any efficient intervening cause, produces the injury, and without which the result would not have occurred."[70] Justice Andrews accurately described the function of the concept when he stated, "What we do mean by the word 'proximate' is that because of convenience, of public policy, of a rough sense of justice, the law arbitrarily declines to trace a series of events beyond a cer-

[64] B.F. Small, "Gaffing at a Thing Called Cause," 31 *Texas Law Review* (1953): 630, 649.
[65] Ibid.
[66] See, e.g., W.S. Malone, "Ruminations in Cause-In-Fact," 9 *Standard Law Journal* (1957): 60.
[67] See, e.g., A.C. Becht and F.W. Miller, *The Test of Factual Causation in Negligence and Strict Liability* (St. Louis, Mo.: Washington University Studies, 1961).
[68] See generally H.L.A. Hart and A.W. Munroe, *Causation in Law* (Oxford: Clarendon Press, 1961), pp. 24-57.
[69] The term "proximate cause" as used by the medical profession means "that which immediately precedes and produces an effect." *Dorland's Illustrated Medical Dictionary,* 25th ed. (1975), p. 275.
[70] See *Black's Law Dictionary,* p. 1391.

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tain point. This is not logic, this is practical politics."[71] Proximate cause, then, represents a device by which the law cuts off defendant's liability.

It would seem logical, from this description of proximate cause, that defendant's liability could exist only to the extent of cause-in-fact. This, however, is not always the case, especially when the cause-in-fact issue is difficult to resolve.

Causation in typical personal injury cases rarely involves questions about the harmful agent's capacity to inflict the harm of which plaintiff complains. Similarly, for an acute, discrete exposure to pollutants, such problems of proof may not be involved.[72] However, where exposure is protracted and involves small amounts of a substance or an agent having low or questionable physiological activity, cause-in-fact becomes a major issue.

Even though legal cause-in-fact is frequently associated with the scientific conceptualization of causation, this comparison begins to unravel where the pollution tort involves chronic and continuous exposure. Just as with Heisenberg's world of electron distribution, the more closely and nicely legal causation is examined, the more uncertainty is revealed.[73]

Scientific cause is typically an analog concept.[74] For example, a scientist tends to describe a substance's mutagenic capacity in terms relative to some known standard. When asked, "Did this substance cause this mutation?," a scientist tends to respond with a statement couched in statistical terms. In a trial, it is the function of the finder of fact to convert this analog signal, i.e., the scientist's answer, into a digital concept of cause-in-fact sought by the court. The court seeks a yes or no answer to the question of cause-in-fact because, in most instances, it must either find for plaintiff or defendant. It is ironic that the very scientific method that provides the scientist with his expert status inhibits his ability as a witness to re-

[71] *Palsgraf* v. *Long Island Railroad Co.*, 248 N.Y. 339, 352, 162 N.E. 99, 103 (1928).

[72] See, e.g., *Filisko* v. *Bridgeport Hydraulic Company,* 176 Conn. 33, 404 A.2d 889 (1978), where the court ruled "scientific proof" was not required in a pollution tort when causation was patently obvious.

[73] W. Heisenberg, "Illustrations of the Uncertainty Relations" in *The World of Laws and The World of Chance* (New York: Simon and Schuster, 1956), pp. 1051-52. The Heisenberg Uncertainty Principle refers to the inability to accurately describe simultaneous values of various quantities with which quantum theory deals. Thus, it is impossible to simultaneously define the position and velocity of an electron.

[74] "Analog," as used here, refers to information or data derived from measuring physical properties capable of having values along a continuum, e.g., length, mass, and temperature. Edgar B. Wilson, *An Introduction to Scientific Research* (New York: McGraw-Hill Publishing Co., 1952), pp. 344-45.

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spond with the desired yes or no answers to the crucial questions of the lawyers.[75]

Confronted with this dilemma, some commentators[76] have argued that the traditional legal concept of cause-in-fact places unreasonable constraints on the ability of the legal system to adequately respond to the need to minimize the risks of future injury, such as those that may be caused by certain pollutants. Others have gone further and argued that both the concept of fault and cause-in-fact are inappropriate in this factual setting. They assert that liability should be found whenever it would be consistent with the efficient allocation of resources.[77]

These inherent problems of "A to D conversion"[78] are accentuated by the different social roles that science, medicine, and law play. Science is used to understand physical reality. Its continued objectivity as it searches for universal principles is to society's advantage. On the other hand:

> [l]aw is a concept . . . representing a system of adjustment toward social harmony and accomplishment in an ordered direction. The system is an evolving one, reflecting the totality of Man's experience of all ages and of all times. It embraces primitive savagery with cultural enlightenment, lustful intemperance with moral awakening, fear with understanding, ignorance with learning.[79]

The "results" science pursues exist independent of their quest, being descriptive of reality. However, in law, the results exist only in the context of that search, borne from the desire for certainty in a world of evanescent, human perception.

3. *Use of Statistical Evidence*

The parties also face difficulty in utilizing scientific data in the courtroom. Courts tend to be suspect of statistical evidence, upon

[75] See Large and Michie, p. 595.

[76] See, e.g., Gelpe and A. Tanlock, "Environmental Decision Making," *So. California Law Review* 48 (1971): 371.

[77] See, e.g., G. Calabresi, *The Costs of Accidents* (New Haven: Yale University Press, 1970); R. Coase, "The Problem of Social Cost," *Journal of Law and Economics* 3 (1960): 1; R. Epstein, "A Theory of Strict Liability," *Legal Studies* 2 (1973): 151.

[78] There is an analogous problem in science where "analog" data is being analyzed in a digital manner. For example, the converting of a change in resistance, which can assume a continuum of values, to a digital representation. See Christie G. Enke, "Data Domains — An Analysis of Digital and Analog Instrumentation Systems and Computers," in *Instrumentation in Analytical Chemistry* (Washington, D.C.: American Chemical Society, 1973), p. 345.

[79] See Small, p. 652.

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which science relies, for four reasons: The extrapolation problem, the "particularity" problem, variations in statistical methodology, and the "negative" bias.

Three extrapolations are usually required in the use of toxicological evidence.[80] First, toxicological findings are usually a product of experiments in which all variables, except one, e.g., the presence or absence of the studied compound, remain constant. From this controlled factual setting, the court is asked to apply the scientific results to the heterogeneous event experienced by plaintiff, i.e., an environment-to-environment extrapolation. Second, the results upon which the court is to rely are often derived from animal studies. Thus, the court is required to assume that the results obtained from studying experimental animals are applicable to man, i.e., a rat-to-man extrapolation.[81] This may present a problem because the incidences of certain diseases, such as cancer, are known to vary with respect to the species of animals used in the experiments, and even between sexes and strains of the same animal.

Third, the dose to which plaintiff is exposed is usually much less than that by which the test organism is challenged. The court is then required to extrapolate the test findings to the significantly different conditions to which the plaintiff was exposed, i.e., an extrapolation to zero. The problem is exemplified by the difficulty in estimating cancer rates from low doses of ionizing radiation. Even though there is a vast experimental literature on the health effects of radiation, a reasonable understanding of the mechanisms of physical damage of the cell which result in cancer, and wide agreement concerning the mathematical relationship between dose and cancer rates, "reasonable men have disagreed by as much as factor of 100 or more in the assessment of the risks from exposures to a single ray of sparsely ionizing radiation, like X-ray or gamma ray."[82] Even when the moving party uses human epidemiological data, the courts may find it unconvincing. Judges recognize that although such studies reveal information on probabilities of causal connection in a population, they are still faced with the legal problem of determining whether a causal relationship exists in the instant case.

Some of these problems with scientific testing techniques and statistical approaches have begun to be resolved by the publication of the Organization for Economic Cooperation and Development

[80] See Large and Michie, p. 561.
[81] Ibid.
[82] C. Land, "Estimating Risks from Low Doses of Ionizing Radiation," 209 *Science* (1980): 1197.

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Guidelines for Testing of Chemicals.[83] That work describes various testing procedures and statistical methods that an international panel of experts consider to be good scientific practice.

There is also the possibility of conflicting results from statistical data due to the particular mode of data reduction employed. This is exemplified in the disagreement between Seskin and Lave's air pollution study and that conducted by Gibbons and McDonald for the General Motors Research Laboratories.[84] In their study, Seskin and Lave concluded that a 50 percent reduction of air pollution would lead to a 4.7 percent reduction in mortality nationally. However, Gibbons and McDonald, using essentially the same data, concluded that such a reduction of pollution would result only in a 0.43 percent reduction in mortality.

Scientific proof may also be subjected to the criticism that it is biased against negative results. For example, if the hypothesis is that compound "X" causes tumors, the positive finding is favored over the negative finding. This bias arises from the operation of the scientific method as well as from practical considerations. The scientific method provides that the failure of the experimental results to conform to the hypothesis does not necessitate the conclusion that the hypothesis is false.[85] Such a conclusion should be made only when the experimenter "in light of the hypothesis, its parameters, the experimental technique, and the treatment of the resulting data . . . [finds] that the experiment would have detected a positive result if the agent being investigated was truly harmful."[86] Furthermore, "[t]here appears to be an urge to generate and publish positive results regardless of how they are obtained."[87] Science, like legal practice, is a business and subject to influences other than the pure purpose of the discipline.

4. Example of Causal Disharmony

These distinctions have led to arguably inconsistent factual findings. A clear example of such confusion is in comparing legal determinations of trauma and radioactive contamination as causes of cancer. An examination of the literature reveals that "[m]ost medical authorities . . . strongly believe that trauma, as a single fac-

[83] See Organization for Economic Cooperation and Development, *Guidelines for Testing Chemicals* (Washington, D.C.: OECD, 1981).
[84] Reported in 119 *Science News* (1981): 152.
[85] See Large and Michie, p. 567.
[86] Ibid.
[87] M. Green, "Scientific McCarthyism," *Chemtech.* 11 (1981): 402, 404.

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tor, is not a causative agent of cancer."[88] Thus, awarding compensation solely on the basis of the appearance of a tumor after a single trauma would appear to be unjustifiable. It must be surprising to the medical profession that awards have been granted by juries finding that such a trauma can cause cancer.

In the case of *Traveler's Insurance Company* v. *Rowand*[89] (a Texas case), Mr. Rowand had suffered a single, severe trauma to his right testicle. Later, Mr. Rowand developed two small malignant tumors on that testicle, which later metastasized.[90] The jury found for plaintiff, even in light of expert testimony detailing the lack of a relationship between trauma and cancer. The court held, in upholding the award, that "it was within the province of the jury upon fair consideration, to believe or disbelieve all or any part of the evidence of this or any other witness where there was a conflict in the evidence or, even if there was no conflict, where the conflicting reasonable inferences might fairly be drawn from the undisputed facts."[91] Thus, the jury is free to disregard all scientific evidence on causation, even if there is no conflicting evidence, if the jury finds the evidence conflicts with inferences as to causation that the jury itself draws directly from the facts of the case.

Contrast this result to the determination of another court in the same state. In *A. Parker* v. *Employers Mutual Liability Insurance Company of Wisconsin,*[92] it was established that Mr. Parker, who worked for nearly five years as a handler of radioactive material (a powerful carcinogen), developed cancer in his groin. The trial court, on these facts, found for Parker; however, the Supreme Court of Texas ruled that, although the doctors testified "that the cancer 'could have' been caused by radiation, a sufficient causal link had not been established."[93] The Texas Supreme Court so found even though there was competent expert testimony as to the carcinogenic nature of radiation as well as facts indicating that Mr. Parker's employer knowingly allowed him to work for a great length of time around radioactive material without bodily protection of any kind.[94] The court distinguished this case from those involving traumatic cancer, stating "trauma has been seen to be so

[88] G. Monkman, G. Orwoll, and J. Ivans, "Trauma and Oncogenesis," *Mayo Clinic Proceedings* 49 (1974): 157.
[89] 197 F.2d 283 (5th Cir. 1952).
[90] Ibid. at 284.
[91] Ibid. at 285.
[92] 440 S.W.2d 43 (1969).
[93] Ibid. at 47.
[94] Ibid. at 50.

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related to the onset of cancer to allow a jury decision whether it was in fact the cause . . . [however in this case] [t]here is no testimony or evidence other than coincidence supporting a reasoned relationship between the radiation and cancer in this case."[95] In the state of Texas, then, the widow and orphan of the late Mr. Parker would have been less destitute had Mr. Parker been hit in the testicles with a canister containing the radioactive material rather than simply having been irradiated by this known carcinogen.

Harm

The extent of liability in tort depends upon the showing that plaintiff suffered an "injury" as a consequence of defendant's action. An injury is "any wrong or damage done to another, either to his person, rights, reputation or property."[96] Where plaintiff, in a pollution tort case, suffers a present observable injury, there is little distinction between this and the more typical tort case. However, where plaintiff has been merely exposed to a potentially harmful pollutant, he or she faces a difficult legal problem to prove that the damages are certain and not speculative. Future damages are awarded only with respect to the prospective costs of present injuries.

Although "[u]ncertainty as to the fact of damages, that is, as to the nature, existence, or cause of the damage, is fatal[97] to plaintiff's recovery, future damages may be awarded *but only* when prospective costs are shown to be reasonably likely to emanate from *present* injuries. Thus, a person who is simply exposed to a harmful pollutant, having a long latency period, would generally not be entitled to recovery. If plaintiff decides to wait to bring suit until the symptoms of the feared disease are manifested, the procedural difficulties of the statute of limitations must be overcome.[98] Other practical evidentiary problems arise, for as time passes, the chances of evidence being lost, and of the defendant becoming insolvent, increase. Even if the court accepted an argument that plaintiff was presently suffering a psychological injury, he or she could recover only those future damages resulting from the present psychological trauma, and not

[95] Ibid. at 48.
[96] See *Black's Law Dictionary,* p. 924.
[97] *Griffith Co.* v. *San Diego College for Women,* 45 Cal. 2d 501, 516, 289 P.2d 476, 484 (1955).
[98] *McKee* v. *Johns-Manville Corp., on appeal* from 94 Misc. 2d 327, reported in *Environmental Reporter* 12 (1981): 529; see also Footnote 42, infra, and accompanying text.

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for those physical injuries that the harmful agent later causes.[99]

A possible movement in this regard is hinted at by the idea that the shortening of one's life through injury is, in itself, a compensable loss. Although the law in the United States is contrary, the rule in Canada and England and that which has been expressed by several dissenting opinions, for example, the *Downie* case,[100] provides that the shortening of life through injury involves an amputation of life's substance and an absolute and irremediable loss and should, therefore, be compensable in and of itself.[101] Thus, where exposure to a pollutant increases the likelihood of plaintiff being inflicted with a disease, such as cancer, one could calculate the effect of that likelihood on the lifespan of plaintiff.

V. Shifting the Burdens of Proof

Burden of Proof

The burdens of proof involve "the obligation of a party to demonstrate the existence of facts that have a desired legal consequence."[102] This consists of two tasks. The first is the burden of producing evidence of sufficient force as to satisfy the judge so that the burdened party will avoid an adverse ruling, e.g., a directed verdict. This burden shifts to the opposing party when the other has discharged his or her initial duty. The second burden is that of persuasion. This refers to the obligation of a particular party to convince the trier of fact to the requisite degree of certainty. Historically, this burden has been stated never to shift since it is not allocated until all of the evidence has been presented.[103]

Generally, the burdens of proof are allocated such that the party having the burden of pleading a fact will also have the burden of producing evidence and persuading the trier of fact concerning the issue pleaded. This task usually falls to the party wishing to disrupt the status quo, i.e., plaintiff. However, this is not always the case. Professor McCormick has stated that "there is no key principle governing the apportionment of the burdens of proof. Their allocation, either initially or ultimately, will depend upon" common

[99] *Noble* v. *Tweedy,* 90 Cal. App. 2d 738, 746; 203 P.2d 778, 782 (1949).
[100] *Downie* v. *United States Lines Co.,* 359 F.2d 344 (3rd Cir. 1966).
[101] Ibid. at 348.
[102] Dworkin, "Easy Cases, Bad Law, and Burdens of Proof," *Vanderbilt Law Review* 25 (1972): 1151, 1153.
[103] McCormick, *Evidence,* 4th ed. (St. Paul, Minn.: West Publishing Co., 1972), pp. 483-84.

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sense and social policy.[104]

The following three subsections show how the burden of producing evidence and the burden of persuasion are shifted in pollution tort cases, with special emphasis on the function of res ipsa locquitur in that process.

Burden of Producing Evidence

In a negligence action, plaintiff initially must produce evidence of defendant's negligence. When he or she has introduced evidence having sufficient persuasive force, defendant is required to offer refuting evidence or lose on the negligence issue. This process can be viewed from two perspectives. In the context of legal theory, once plaintiff has introduced such evidence that a reasonable person would be *required* by law to find defendant negligent, defendant must introduce evidence to show that he or she was not. However, in a practical context, once a reasonable person *may* feel defendant to be negligent, defendant should introduce evidence to show that he or she was not negligent.[105]

For example, in *Hagy* v. *Allied Chemical and Dye Corp.*,[106] Mrs. Hagy sued Allied for the negligent operation of its sulfuric acid plant, alleging that through this negligence she was exposed to a cloud of sulfureous fumes that caused her pre-existing cancer to be "lighted up," which in turn necessitated the removal of her larynx. Defendant contended that there was no causal connection between the smog and Mrs. Hagy's cancer. The court recognized that Mrs. Hagy had the burden of producing evidence to show that sulfureous fumes had the ability to "lighten up" a pre-existing, dormant cancer and that sulfureous fumes generated at the defendant's plant aggravated Mrs. Hagy's pre-existing cancer. However, the court was careful to delineate the scope of that burden by holding that plaintiff need not show that the removal of her larynx would not have been necessary *but for* her exposure to the acidic fog. Rather, the burden fell upon the defendant to show that the larynx would have been removed even though Mrs. Hagy had not been traumatized by the fog.[107]

This shifting of the burden from Mrs. Hagy to the plant operator was particularly important because the case involved difficult causation questions, including allegations of intervening events in

[104] Ibid.
[105] See Dworkin, p. 1159.
[106] 122 Cal. App. 2d 361, 265 P.2d 86 (1953).
[107] Ibid. at 370, 265 P.2d at 92.

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the form of failure of doctors to properly diagnose and treat Mrs. Hagy's afflictions.

The shifting of the burden to produce evidence in a nuisance case was exemplified in *Renken* v. *Harvey Aluminum Company.*[108] There, a group of landowners sought an injunction to restrict the operation of defendant's plant so that excessive amounts of fluorine would not be released. The court found that plaintiffs had discharged their burden by producing evidence showing that fluorides were deposited upon their land. Then, "the burden of going forward with the evidence was on the defendant to show that the use of its property, which caused the injury, was unavoidable or that it could not be prevented except by the expenditure of such vast sums of money as would substantially deprive it of the use of its property."[109]

Potential defendants in pollution tort cases are beginning to recognize that as a practical matter the burden is likely to fall to them to prove their innocence. The importance to such defendants of being fully prepared to prove innocence was emphasized in a series of articles by Raymond M. Momboisse in the April and May issues of the magazine, *World of Agricultural Aviation.*

Burden of Persuasion

The burden of persuasion "represents an attempt to instruct the fact finder concerning the degree of confidence our society thinks he should have in the correctness of factual conclusions for a particular type of adjudication."[110] There are generally two "degrees of confidence" that the burdened party in a civil case may be required to meet.

The most common standard is the "preponderance of the evidence," which requires that after weighing the entirety of the evidence upon a particular point, the trier of fact is to find for the party whose evidence is the more convincing.[111] The second standard, "clear and convincing," requires some quantum of higher certainty on the part of the fact finder. It is used in civil cases involving special types of allegations, usually where defendant is accused of committing a quasi-criminal activity such as fraud.[112] In determining the degree of confidence, the rationale is that where one of the two parties has an interest of "transcending value [the]

[108] 226 F. Supp. 169 (D. Or. 1963).
[109] Ibid. at 174.
[110] *In Re Winship,* 397 U.S. 358, 370, 25 L. Ed. 368, 379, 90 S. Ct. 1068, 1076 (1970).
[111] See McCormick, pp. 794-95.
[112] Ibid.

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. . . margin of error is reduced as to him by the process of placing on the other party the burden of producing a sufficiency of proof."[113]

Similarly, in determining the degree of certainty to which the burdened party must move the trier of fact in pollution tort cases, the law should look to the relative importance of the interests at stake. In doing so, attention is given not only to the particular interests of the parties before the court, but also to those "transcending values" society seeks to advance.[114]

An essential aspect of this process involves focusing upon the types of errors possible and examining the relative impact upon society's interests if an error is committed in the decision-making process. There are two such types of errors: Type I — finding "A" to exist, when "A" in fact does not exist; Type II — not finding "A" when "A" in fact does exist. The degree of confidence required must take into account the nature and consequence of the risk of error in finding or not finding a fact to exist. Where the facts themselves appear to be unsettled, as may occur in a pollution tort, the fact finder is faced with the problem of choosing between two alternatives, both of which have an uncertain probability. It has been stated that where an agency's regulation turns on "choices of policy, or on assessment of risks, or on predictions dealing with matters upon the frontiers of scientific knowledge, we will demand adequate reason and explanation, but not 'findings' of the sort familiar from the world of adjudication."[115] In effect, then, the court is going to be satisfied with less certainty when the basic factual elements are in doubt, i.e., the frontiers of science.

The decision to accept Type I or Type II errors should be made by carefully addressing the respective interests represented by each party in the courtroom. In a pollution tort case, there are usually two essential interests before the court: Economics and health. These interests are not mutually exclusive; the loss of one may also result in the loss of the other. The issue is not economics versus health, but how much certainty of each society is willing to abandon. This analysis requires a clear understanding of the true extent and nature of the health hazards that pollutants may cause. This is

[113] *Speiser* v. *Randall,* 357 U.S. 513, 525-26, 2 L. Ed. 2d 1460, 1472, 78 S. Ct. 1322, 1342 (1958).

[114] See Rothbard, p. 70. Rothbard advocates the "beyond a reasonable doubt" standard for both civil and criminal cases. He believes that it is axiomatic to libertarian philosophy that "when we don't really *know* . . . the only procedure consonant with libertarian principle is to do nothing."

[115] *Amoco Oil Co.* v. *Environmental Protection Agency,* 501 F.2d 722, 740-41 (D.C. Cir. 1974).

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especially important where the pollutant is suspected of interfering with the genetic material or the gene plasma pool and where the effects of that interference cannot be discovered for several years or perhaps until future generations. On the other hand, knowledge of the economic consequences of choosing a particular course of action must also be fully assessed.

The decision to opt for a Type I or Type II error, like cost-benefit analysis, is fraught with methodological difficulties and possible misuse. The chief problems are that environmental and economic interests are not capable of a one-to-one pairing; although easier to express than benefits, costs may be no more certain or reliable; and the methods of deciding between the two appear neutral, but actually consist of value-laden assumptions.[116]

So when courts deal with pollutants they should recognize the potential for an asymmetrical distribution of the effects of error. For example, if plaintiff suffers from a mutation and can show that he or she was exposed to compound "X," then the question society must face is whether it is more in the public interest to risk erroneously finding "X" to be mutagenic and thereby give plaintiff a windfall and create an undue burden upon the producer of "X," which amounts to a misallocation of resources (and may deprive society of the value of "X"), or to risk erroneously finding "X" to be nonmutagenic and thereby cause plaintiff and others who may be in a like position to go uncompensated while providing the producers a windfall, which again would be a misallocation of resources.[117]

Res Ipsa Loquitur

Res ipsa loquitur, "the thing speaks for itself," is a legal presumption of special importance for pollution torts.[118] The proper application of this doctrine often permits the double inference that the injury was caused in a particular manner, and that defendant's conduct with reference to that cause was negligent; i.e., the doctrine supplies a crucial missing fact or facts.[119] The classic statement of the rule is:

[116] See N. Ashford, "The Limits of Cost-Benefit Analysis in Regulatory Decisions," *Technology Review* 70 (May 1980).
[117] For an extensive discussion of this topic, see T. Page, "A Generic View of Toxic Chemicals and Similar Risks," *Ecology Law Quarterly* 7 (1978): 207; see also Gelpe and Tarlock, "The Uses of Scientific Information in Environmental Decisionmaking," *So. California Law Review* 48 (1974): 371.
[118] See *Black's Law Dictionary* p. 1067.
[119] See Prosser, p. 217.

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> There must be reasonable evidence of negligence; but where the thing is shown to be under the management of the defendant or his servants, and the accident is such as in the ordinary course of things does not happen if those who have the management use proper care, it affords reasonable evidence in the absence of explanation by the defendants, that the accident arose from want of care.[120]

A particularly important requirement is that res ipsa loquitur applies only where, in light of past experience, the injury or accident was probably the result of someone's negligence. One could argue, in an area of new technology, where knowledge and experience of its hazards are limited, that the doctrine would not be applicable.[121]

The certainty with which the inference of negligence must be established for the application of the doctrine to be proper is viewed in two ways. One view is that the inference must be of such compelling force that no other acceptable cause for the accident could be reasonably advanced. The opposing view is that the court only must find that reasonable men could make the connection between the circumstances of the accident and defendant's negligence.[122] This latter requirement appears to be so minimal, in a practical sense, as to be meaningless once plaintiff has survived a motion for a demurrer or nonsuit.

Another aspect of this doctrine, which may effect the viability of a pollution tort action, is its applicability to multiple defendants. Although joint control does not prevent the application of res ipsa loquitur, it is inappropriate if there is uncertainty as to which of two or more defendants had control of the instrumentality causing the injury.[123] However, res ipsa loquitur may be used against multiple defendants where the circumstances indicate the probability that all defendants were negligent.[124] These considerations may be of extreme importance in a *Sindell* setting.[125] Even where the doctrine is applicable against only one of several defendants, those other defendants may suffer from a shifting of the burden, for, as a practical matter, the jury may have difficulty limiting the presumption

[120] *Scott* v. *London & St. Katherine Docks Co.*, 3 H & C 596, 601, 159 Eng. Rep. 665, 667 (1865).
[121] See Prosser, p. 216. See also, J. Bodie, "The Irradiated Plaintiff: Tort Recovery Outside Price-Anderson," *Environmental Law* 6 (1976): 859, 879.
[122] *Bauer* v. *Otis*, 133 Cal. App. 2d 439, 443, 284 P.2d 133, 136 (1955).
[123] See this article, p. 130.
[124] *Pruett* v. *Burr*, 118 Cal. App. 2d 188, 194 257 P.2d 690, 694 (1953).
[125] See this article, p. 130.

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just to the proper defendant.

In a pollution setting involving a new product or activity, this rule may be applied harshly against the alleged polluter. For example, in the *Yturbide* case, the Martin family sued for personal injuries allegedly received from fluoride compounds released from defendant's aluminum plant.[126] Since the instrumentality was under the exclusive control of defendant, the court held that the doctrine of res ipsa loquitur was applicable. However, the court recognized the dilemma that the operation of this rule placed on defendant:

> the less effective his precautions to prevent the occurrence the more apt they are to appear negligent; the more effective the precautions testified to, the less likely they are to have [been] taken in this case since the accident *did happen.*[127]

The key attribute of res ipsa loquitur is its availability as an alternative theory in pollution tort cases where the primary theory may be difficult to establish. An example is *Suko* v. *Northwestern Ice Company,*[128] where plaintiff was injured when the tank located on defendant's building burst, sending water down upon plaintiff's house, causing extensive property and personal injury damage. The court, although noting the similarity of facts between this case and *Rylands* v. *Fletcher,*[129] failed to apply the doctrine of strict liability. Rather, the court held that "when the plaintiff proved the collapse of the tank and the injuries suffered by him as a result thereof, he made out a prima facie case of negligence [with the aid of the doctrine of res ipsa loquitur] on the part of the defendant."[130]

In essence, res ipsa loquitur may operate as an alternative route from the facts to a finding of liability, and it is one in which the causation hurdles have been lowered.[131] Instead of focusing on the actions of defendant to ask whether they were negligent and caused injury, the jury focuses on the nature of the incident to determine whether it ordinarily would have occurred in the absence of

[126] See *Reynolds Metals Co.* v. *Yturbide.*

[127] Ibid. at 332 (emphasis in original).

[128] 166 Or. 557, 113 P.2d 209 (1941).

[129] See Footnote 12.

[130] *Suko,* 166 Or. at 567-69, 113 P.2d at 214.

[131] *Jiminez* v. *Sears Roebuck and Company,* 4 Cal. 3d 379 (1979). In this case, the California Supreme Court found that even where plaintiff attempts to demonstrate negligence on the facts, he or she is also entitled to a res ipsa loquitur instruction. This case also depicts the possibility of applying res ipsa loquitur to strict liability. Where the plaintiff asserts two legal theories for liability, e.g., negligence and strict liability, the use of the res ipsa loquitur presumption by the jury may not be limited simply to negligence, but they may incorrectly apply it to the strict liability theory.

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negligence. Therefore, in a difficult pollution tort case, res ipsa loquitur focuses the jury on the strength of plaintiff's case — the injury — and away from the probable weakness — the causal connection to defendant's actions.

Identification of Defendant

Identification of defendant is a problem common to pollution tort cases since the origin of the pollutant is often unknown. The courts have devised several concepts to relieve plaintiff of this difficulty by shifting the burden to defendant to show that he or she is not a proper defendant. In the recent California decision of *Sindell* v. *Abbott Laboratories,*[132] the Supreme Court discussed these techniques and established a new method to achieve this result.

Judith Sindell, plaintiff, developed a malignant bladder tumor, which was removed by surgery. She also suffers from adenosis and must be constantly monitored by biopsy and colposcopy. These conditions were allegedly caused by her mother's ingestion of diethylstilbestrol (DES), as prescribed by a physician. In her suit, plaintiff joined only a small percentage of the 200 companies that produced DES during the time in question; however, the joined defendants represented approximately 90 percent of the DES marketed. Although plaintiff admitted that she was unable to identify the particular manufacturer of the drug her mother had ingested, it was argued that defendant could be held liable under one or all of three theories; the theory promulgated under *Summers* v. *Tice,*[133] the *Restatement* doctrine of concert of action, and the theory of enterprise liability.

In *Summers,* plaintiff was injured when two hunters simultaneously and negligently shot in his direction. It could not be determined which of the two had fired the shot that injured plaintiff's eye; however, both defendants were held jointly and severally liable for all damages. The court reasoned that, as between two negligent and joint tortfeasors and the innocent plaintiff, it would be unfair to require plaintiff to isolate and identify defendant responsible. The California Supreme Court held the *Summers* rule inapplicable in *Sindell* because there was a chance that the actual tortfeasor was not among the few companies before it.

In the alternative, plaintiff argued that the *Restatement (Second) of Torts* doctrine of concert of action applied.[134] Here, plaintiff brought

[132] 26 Cal. 3d 588, 163 Cal. Rptr. 132, 607 P.2d 924 (1980).
[133] 33 Cal. 2d 80, 199 P.2d 1, 5 A.L.R.2d 91 (1948).
[134] *Restatement (Second) of Torts* §876.

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evidence showing that all manufacturers of DES followed a common and mutually agreed upon formula, so as to allow the drug to be treated as a "fungible commodity." However, the court pointed out that the formula for DES was based upon a scientific constant as set forth in the United States Pharmacopoeia. Plaintiff also argued that defendants shared testing data and marketing methods. The court rejected an inference of concert of action by stating, "such conduct describes a common practice in industry; a producer avails himself of the experience and methods of others making the same or similar products. Application of the concept of concert of action to this situation would expand the doctrine far beyond its intended scope."[135] Thus, the court held that there was no concert of action among defendants within the meaning of the *Restatement* doctrine.

Third, the theory of enterprise liability has been suggested in the case of *Hall* v. *E.I. DuPont de Nemours.*[136] This theory of liability provides that when the manufacturers of a product, in effect, delegate safety and design features to a trade association and where there is industry-wide cooperation in the manufacturing of the product in question, that the members of that industry could be held jointly liable in accordance with their proportionate share of the product's market. The California Supreme Court refused to apply this doctrine in the *Sindell* case. First, the court respected the caution of the *Hall* court's decision that the doctrine should not be applied where there are a large number of producers. Second, because so much of the manufacturers' conduct was required by federal regulation, the court could not find the sort of delegation of responsibility required by the enterprise doctrine.

Although the California Supreme Court rejected each of these established theories, it nonetheless granted recovery. In justifying the extension of liability, the court stated:

> The response of the courts can be either to adhere rigidly to prior doctrine, denying recovery to those injured by such products, or to fashion remedies to meet these changing needs. . . . From a broader policy standpoint, defendants are better able to bear the cost of injury resulting from the manufacture of a defective product.[137]

The court determined that if plaintiff was able to join a "substantial share"[138] of the producers of the product causing the injury, then

[135] *Sindell,* 26 Cal. 3d at 605, 163 Cal. Rptr. at 141, 607 P.2d at 933.
[136] 345 F. Supp. 353 (E.D.N.Y. 1972).
[137] *Sindell,* 26 Cal. 3d at 610-11, 163 Cal. Rptr. at 144; 607 P.2d at 936.
[138] Ibid. at 612, 163 Cal. Rptr. at 145, 607 P.2d at 937.

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"the injustice of shifting the burden of proof to the defendants to demonstrate they could not have made the substance which injured the plaintiff is significantly diminished."[139] The court held that liability would exist to the extent of defendant's market share.

All of these theories, particularly the *Sindell* extension, suggest potential for pollution tort cases. Combining the use of res ipsa loquitur to reduce the burden of proof related to causation with the *Sindell* approach to relieving plaintiff of responsibility to identify defendant opens the door to the opportunity to "get to the jury" with a case of possible injury from pollution of uncertain origin.

Problems of Shifting the Burden of Proof

The courts should be cautious when altering the traditional burdens of proof, especially in pollution tort cases. Where there is a high degree of scientific uncertainty about the inferences to be drawn from scientific evidence, the party assigned the burden may be unable to marshal evidence of sufficient force and clarity to meet the required standard of proof. Therefore, shifting of the burden of proof may be tantamount to the enactment of a general principle of resource distribution.

The courts and legislatures must also be sensitive to the practical aspects of the jury decision-making process. In cases involving highly emotional, complicated, and unsettled concerns, such as pollution tort cases, the "rules" of litigation often play a more limited role than the lawyers and judges would desire. As Justice Jackson stated, "Juries are not bound by what seems inescapable logic to judges."[140] In the uncertainty of pollution tort cases, the jurors may take a more visceral approach to the determination of rights and liabilities. As Finley Peter Dunne said:

> Whin th' case is all over, the jury'll pitch th' tistimony out iv the window, an' consider three questions: 'Did Lootgert look as though he'd kill his wife? Did his wife look as though she ought to be kilt? Isn't it time we wint to supper?'[141]

VI. Alternative Approaches to Adjudication

The present legal institution appears likely to suffer significant stress if required to administer a large-scale pollution tort compen-

[139] Ibid. at 613, 163 Cal. Rptr. at 145, 607 P.2d at 937.
[140] *Morissette* v. *United States of America,* 342 U.S. 246, 276 (1951).
[141] Finley Peter Dunne, *Mr. Dooley in Peace and in War* (Boston: Small, Maynard & Co., 1898), p. 145.

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sation program. The structure of that system does not adequately match the conceptual and practical demands placed upon it by pollution torts. Congress has recently recognized this problem in Section 301(e) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980.[142] This law establishes a study group "[i]n order to determine the adequacy of existing common law and statutory remedies in providing legal redress for harm to man and the environment caused by the release of hazardous substances into the environment."[143] This statute directs that the study group evaluate many of the problem areas discussed in this paper, including problems of causation and proof. A report to Congress is required, which must address "the need for revisions in existing statutory or common law."[144] The tenor of the statute implies that the "need" that is to be addressed is the need to insure the availability of adequate recovery mechanisms. The statute does, however, recognize that the expanded liability that may result can have significant adverse economic effects.[145] Congress recognized this potential by requiring the study group to address "the consequences, particularly with respect to obtaining insurance, of any change in [the scope of liability under existing law]."[146]

The problem presented here was exemplified in the *Hagy* case. There, compensation was possible for Mrs. Hagy when her preexisting cancerous condition of the larynx was arguably aggravated when she was exposed to an unusual concentration of toxic fumes emitted from the plant of a large corporation.[147] However, the railroad yard workers located nearby who were chronically exposed to the substantially lower, "normal" levels of the same fumes receive no compensation and neither do the residents of the neighborhood over which the fumes regularly waft. Yet these persons may be able to show a cumulative exposure far in excess of Mrs. Hagy's discrete event. They are, however, hard pressed to

[142] P.L. 96-510, 94 Stat. 2767, 42 U.S.C. §§9601, et seq.

[143] 42 U.S.C. §9651(e)(1).

[144] 42 U.S.C. §9651(e)(4)(A); the study was due in December 1981.

[145] This concern for a balance of tort recovery and economic consequence, in part, has grown out of experience with product liability law. That development demonstrates the institutional confusion which occurs when the court system waivers in confusion on whether to administer the tort system for its "classic" purpose of apportioning liability based on fault or for its "modern" purpose of providing a compensation system for injured persons. See, e.g., *Hearings Before the Select Committee on Small Business, United States Senate, on Products Liability Problems Affecting Small Businesses* (Washington, D.C.: U.S. Government Printing Office, 1977).

[146] 42 U.S.C. §9651(e)(3)(E).

[147] See *Hagy* v. *Allied Chemical Co.* at 60.

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show "fault" in the "normal" levels of emissions, and they encounter serious "proof" problems in trying to link any minor, present debilitations directly to the low-dosage exposure to the fumes. In addition, their most serious difficulty with obtaining an award may be the lack of sympathetic commiseration by the court and the jury in the absence of any severe physical disability. Therefore, the individuals who probably receive the greatest injury from the pollution go uncompensated while a person to whom the fumes may in fact have made no difference at all receives a substantial award.

As technology plays a greater role in human experience, the pressure grows for compensation for injuries resulting from that technology. This reality is the basis of various workers' compensation programs and special compensation programs such as the Black Lung Benefit Act.[148] New Zealand has already gone beyond these concepts by establishing a general compensation system.[149]

The essential shortcoming of the legal system in this context is that it inadequately manages new information and demands; it is not, fundamentally, a "learning" system. This is the case for four reasons: (1) like all other institutions, it perceives new demands as a challenge to its authority; (2) the law applies a retrospective analytical scheme; (3) it has the ability to resolve an individual dispute while ignoring the impact of that decision upon the more general problem; and (4) it responds in a digital fashion even when utilizing analog information. Such a system is likely to suffer significant stress and produce unpredictable results if pressured to adjudicate rights in the midst of the rapidly changing attitudes and scientific understanding relating to pollution-caused injuries.

The ideal modern institution for conflict resolution should have the capacity to "learn."[150] Learning, in this context, refers to the ability of an institution to change, to accept and utilize new information, to abandon past conclusions, and to recognize its function as part of a network of conflict resolution devices. The need for learning systems is even more pronounced in areas of rapid change.

A learning system tends to be self-limiting in size and scope. Institutions, because they operate through human beings, generally have a desire to expand their control in order to insure their security. The inevitable bureaucratic demands for power and security create permanence and high growth rates. A learning system avoids

[148] 33 U.S.C. §§901, et seq.
[149] New Zealand Public Act No. 36, Accident Compensation Amendment, Vol. 1 (1978), p. 296.
[150] See Schon, pp. 181-200.

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these undesirable attributes by continually evolving as part of a network of conflict-resolving devices rather than functioning as a fixed, centrally oriented organization.[151]

The concept described here requires an extra decision step, which will enhance the judicial system's ability to learn. A requirement is imposed for the courts to address, in a law and motion context, an initial question of justiciability. At a preliminary stage the parties will set forth the nature of both the pollutant and the injury involved and will argue to the court whether the alleged causal connection is capable of proof in the judicial setting. In making this determination, the court can focus on the Type I — Type II error problem — that is, whether in balancing the interests of claimants and society, it is better, given the state of scientific knowledge, to find a causal connection when it does not exist or not to find a causal connection that does exist.

First, the court decides whether plaintiff has stated a justiciable harm. Second, it must determine the reliability and certainty of the causation evidence. This finding includes the determination of two subissues: (1) is defendant the (a) source of the pollutant; and (2) was the injurious act a high-dose, discrete event or a low-dose, chronic event? Most cases presented presumably would involve an exposure event and dosage level well within the bounds of cases previously litigated in the judicial system. Attention would focus on the relatively few cases in which the nature of the event and the dosage level present the close questions of proof.

This decisional paradigm requires that the court examine the context of the case. It does this in two ways. First, it examines the extra-party effect of the remedies sought by determining the potential number of plaintiffs and the economic consequence of the possible judgments. Second, the court determines the symmetry of consequences involving Type I and Type II errors.

This approach to pollution torts has three long-range advantages. By focusing squarely upon the issues of harm and causation in a nonjury setting, the court will organize the scientific knowledge in question and subject it to an adversarial peer review. Also, by handling new information in this way the court would act as an educational device by clarifying areas of scientific uncertainty and demarking the parameters of legitimate danger. And third, the system is self-limiting with respect to the growth of coercive government action through an administrative process. As scientists

[151] See Schon, pp. 190-197.

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and doctors learn more about a certain pollutant and can acknowledge, with an acceptable degree of certainty, causal relationships between the pollutant and observed or likely injuries, the scope of justiciable claims under the tort system can expand. The screening of pollution tort cases for justiciability will remove the pressure on the legal system expressed in the *Sindell* case to distort established theories, rules, and procedures in order to grant compensation to needy plaintiffs who appear cloaked in sympathy but bearing no truly justiciable claim.

This decision process suggests a possible alternative for a concept such as a "scientific court."[152] Here, it would operate as a special court of appeal with limited jurisdiction to resolve only questions of justiciability of the tort claim based on pollution-engendered injuries.

VII. Conclusion

Issues of causation, harm, and standards of proof in pollution-engendered tort actions vary with the nature of the pollutant, the nature of the event giving rise to the plaintiff's exposure, the tort theory asserted, and the forum in which the case is litigated. Established tort theories and judicial doctrines have been used for many years with varying results to obtain recovery for obvious physical injuries related primarily to discrete events of pollution. Attempting to force-fit this judicial mold to new, exotic pollutants and related low-dosage events promises to distort the established theories and exacerbate the problems of uncertainty of recovery and unpredictability of liability that have been growing in recent years. The court is required to force a yes or a no answer to questions for which the only candid answer is maybe. As seen in *Sindell,* this circumstance creates pressure on the judicial system to develop and to utilize flexible judicial theories to achieve results considered to be consistent with broad social concepts of fairness and justice. As each court system's perception of these concepts varies, so vary the results.

It is but a modest proposal to suggest that the courts should adjudicate only justiciable claims and that the perception of justiciability should be reasonably uniform throughout the jurisdiction.

[152] J. Martin, "Procedures for Decisionmaking Under Conditions of Scientific Uncertainty: The Science Court Proposal," *Harvard Journal on Legislation* 16 (1979): 443; H. Markey, "A Forum for Technocracy," *Judicature* 60 (1977): 365; L. Kantrowitz, "The Science Court Experiment: Criticisms and Responses," *Bulletin of Atomic Scientists,* April 1977; R. Tolbatt, *Environmental Law* 8 (1978): 827.

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EVIDENTIARY PROBLEMS IN POLLUTION-ENGENDERED TORTS

Sidney Shindell

This paper reviews the kind of evidence that can be gathered and the utility such evidence can have in bearing upon the central issues of a trial concerning alleged harm resulting from an environmental pollutant.

In order to determine whether harm has resulted from something introduced into the environment, one must answer four questions:

(a) Is there evidence that something was introduced into an environment that normally would not be expected to be there?

(b) Is there evidence that the substance introduced is capable of causing harm?

(c) Is there evidence that this substance causes harm?

(d) Is there evidence that the harm present was related to the substance that was introduced?

The type of evidence available is critical. If direct scientific evidence were available more often, no issue would remain. What one usually has to deal with, however, is objective evidence from which an inference may be drawn. The persuasiveness of the evidence in question usually depends upon the qualifications of the presenter and the type of inference that can be drawn from the available data.

The matter of qualifications of the "expert" may be easily disposed of. Normally a toxicologist or an epidemiologist can supply the needed data. A toxicologist knows what substances can adversely affect animal and vegetable life, and an epidemiologist studies effects on population groups. In both fields, there are variations in quality and limitations inherent in the techniques available.

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Even competent studies seldom answer any of our questions directly; hence there is an opportunity for bias in the inferences drawn.

With these limitations in mind, I'd like to review each of the aforementioned questions and indicate the type of evidence available to deal with each.

Is Pollution Evident?

To answer the first question, we must first determine the presence of the substance, and then decide whether or not it was normally expected to be there.

The detection of the presence of a chemical substance used to be a simple matter, using a standard test. Today, however, technology permits detection of substances in infinitesimal amounts. One must often wonder whether the detection of a substance considered to be an environmental pollutant is not due simply to our increased technical capability to detect it, rather than to its being newly introduced.

There is an unquestioned bias on the part of some laboratories in reporting negative results. If one submits a specimen for a chemical analysis, seldom, if ever, does one get a "negative" report. The usual report reads "below detectable limits," implying that there is a minute quantity present but current technology is insufficient to reveal its presence.

This is important for two reasons: There is a body of opinion in our society that suggests that the presence of any quantity of certain substances is intolerable; and, in spite of the fact that we have had the current technology available for only a short time, and we really don't know what the levels of certain substances were in the environment before they were detectable, it is presumed that if detectable now, the substance must have been newly introduced.

In examining the validity of such a view we need to define a pollutant. Except for meteorites, everything on this earth came from this earth. We may concentrate substances, reduce them to component parts, combine them with other substances, or separate them. But every substance is matter that is part of the chemistry of our planet.

Pollution, then, is not necessarily the result of a new substance being created, but may be due to the collection at one point on this earth of substances normally found elsewhere. In their original habitat, they were not considered pollutants, but resources. As we develop new chemical combinations having commercial applica-

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tion, it is surprising to find that some creature has produced a similar substance. Hence, with pollution we often are not dealing with exotic substances, but with an abnormal concentration in time and space.

Quantity and location are important because of the effects on our renewable resources. We constantly reuse the air we breathe and the water we drink. We require a symbiotic relationship with the vegetation on our planet, not only as it contributes to making our air rebreathable or our water redrinkable, but in its role in the food chain. Pollution exists when sufficient quantities of a substance are present to threaten the integrity of the renewable resources or the health of the people living in the area.

Renewable resources are threatened because of the time required to reduce the concentration at a specific place or to reconvert a synthetic substance to nontoxic component parts. While all substances are ultimately degradable, too much in too limited a space may prevent the ecosystem's recycling of the more elementary components.

Thus, pollution is a matter of judgment, depending upon how much of a substance exists in a specific location. When the quantity is great enough to temporarily stress the ecological system, it is agreed that pollution is present.

So the evidentiary questions relate to identifying and quantifying the allegedly polluting substance. Is the amount more than what would normally be expected to be there? Unless data from previous analysis is available, one must look to comparable geographic areas to determine the range of "natural occurrence," to use as a gauge. Unfortunately, too few studies have been done showing the distribution of polluting substances. Usually extensive sampling is necessary in order to produce comparative data to assess the significance of the level found.

Is the Pollutant Potentially Harmful?

The second question, "Is the substance introduced capable of causing harm?" must be dealt with in a similar fashion. There is no such thing as a totally innocuous substance. Every substance, under the right conditions, can result in injury to some biological unit.

Application of large quantities of a substance to a species of experimental animals is considered to be persuasive evidence of the potential harm of minute quantities to other life forms. This is postulated even if the animals metabolize the substances in significant-

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ly different ways. I'm not suggesting that animal studies do not have value. I am suggesting that extrapolation from animal studies must be done with caution and considered as only part of the evidence concerning the potential effect of substances present in our environment.

We have a particularly difficult problem with studies in species other than man when dealing with substances that are used because they are selectively lethal to specific life forms. Insecticides and herbicides are used precisely because they interfere with the metabolism of the target organisms. If they weren't effective killers of specific animals or plants, we wouldn't use them. The problem with these substances is the quantity that is tolerable by other life forms.

It is because various species metabolize some substances differently that we can have insecticides and herbicides with minimal effects on other life forms in normal quantities. Yet we tend to forget or disregard interspecies differences when we do studies on mammals. In such studies the assumption is that, moving up the evolutionary ladder, metabolic processes are similar to those in parallel species, and that an adverse effect on one species of mammal signals a comparable effect on another.

This is not true. Instead, what's required is an examination of the effect of a substance on the human organism itself. This is what epidemiology is about. The word is derived from the Greek and literally means "the study of what is upon the people."

In addressing the question of the harmfulness of a substance, we often study the experience of an accessible segment of the population that has had contact with similar amounts of the substance. This is usually a group of workers who have been engaged in the preparation or application of the substance, often over a long period of time.

Table I is an example of the findings of such a study.[1] The data analyzes the number of deaths among all individuals who had worked three months or more in the one plant in the United States that made a chlorinated hydrocarbon insecticide, gathered over the 34-year lifespan of the plant. The table shows that the death rate of this employee group compared favorably with the U.S. population as a whole during the same period of time.

Prior to this study, there was concern over the possibility of an in-

[1] Sidney Shindell, I. Slack Ulrich and Eldred E. Giefer, "The Epidemiology of Chlorinated Hydrocarbon Insecticides," in M.A.Q. Khan, ed., *Halogenated Hydrocarbons* (New York: Pergamon Press, 1981).

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TABLE 1

DEATHS AMONG FORMER EMPLOYEES: 1 JANUARY 1946—31 DECEMBER 1979 VELSICOL CHEMICAL CORPORATION — MARSHALL, ILLINOIS PLANT COMPARED WITH U.S. POPULATION BY CAUSE AND JOB/PRODUCT CLASSIFICATION

Employee Group	All Causes (all ICDA)		Malignant Neoplasms (cancers) (140-209)		Cardio-vascular (heart disease) (390-429, 440-458)		Cerebro-vascular (stroke) (430-438)		Trauma (external causes) (E800-E999)		Other & Unknown (000-136, 210-389, 460-999)	
	Vels.	U.S.	Vels.	U.S.	Vels.	U.S.	Vels.	U.S.	Vels.	U.S.	Vels.	U.S.
White Males												
Opr. Pesticide	8	8.10	1	1.59	5	3.29	—	0.39	1	1.23	1	1.60
Opr. Resins	15	15.84	1	3.05	8	6.42	1	0.84	3	2.45	2	3.80
Opr. Multiple	5	5.21	2	0.98	—	2.32	1	0.30	1	0.51	1	1.00
Opr. Raw Matl.	5	9.25	1	1.76	3	4.00	—	0.61	1	1.11	—	1.77
Shipping	13	18.20	2	3.53	7	8.31	1	1.33	2	1.59	1	3.44
Maintenance	25	31.44	7	6.34	14	14.21	1	2.04	1	2.84	2	6.01
Laborer	19	19.68	3	3.73	8	8.88	—	1.45	4	1.91	4	3.71
Laboratory	11	15.49	2	2.99	8	6.69	1	0.98	—	1.84	—	2.99
Engineering	7	8.33	1	1.66	5	3.61	—	0.49	1	0.97	—	1.60
Mgmt/Clerical	12	11.00	2	2.19	6	4.96	—	0.74	—	1.02	4	2.09
Total White Males	120**	142.54	22	27.92	64	62.69	5	9.17	14	15.47	15*	27.29
Nonwhite Males	—	0.05	—	0.01	—	0.00	—	0.00	—	0.03	—	0.01
Females	4	2.95	—	1.00	—	0.63	1	0.18	—	0.41	3*	0.73
TOTAL	124	145.54	22	28.93	64	63.32	6	9.35	14	15.91	18*	28.03

*Statistically significant difference ($p < 0.05$) **Statistically significant difference ($p < 0.01$)

Numbers shown in parentheses under specific disease headings are the ICDA, 8th Revision categories included.

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crease in deaths from cancer associated with the use of this insecticide. The study shows no excess cancer risk. This was true even in the presence of other data demonstrating that workers engaged in pesticide manufacture had an amount of the substance in their bloodstream far in excess of that of the general population.

In a study of some 6,000 pesticide applicators conducted by an independent investigator, a similar finding was reported.[2] Thus, corroborative evidence is available to bring to bear on the issue of the potential harm to the general populace or to individuals exposed under specific circumstances. These data have been used in product liability actions to ascertain whether the substance in question is capable of causing harm in the amounts encountered by a claimant.

Analogous to the situation with laboratory determinations, the epidemiology study also reports findings essentially "below detectable limits." In this instance, however, it is not because there is a presumption that a more sensitive technique might detect a hazard, but it is an acknowledgement that in spite of the most sensitive technique available, the hazard, if it exists, is of such low magnitude that it cannot be demonstrated.

The author of the study from which these data are derived states: "There is, thus, no evidence of any long-term, latent effect on health related in any way to employment at the Velsicol plant in Marshall, Illinois, for the thirty-four year period in which it has been engaged in the production of chlorinated hydrocarbon insecticides."

It is not suggested that under all circumstances the insecticide is innocuous, any more than either plain table salt or plain water is innocuous under all conditions. Whether a substance is harmful depends upon the type of harm alleged or suspected and how much of the substance is present.

The inference is, then, that if under certain conditions no hazard can be demonstrated, this should be true under comparable conditions. Or, as is more usually the case, if in circumstances where there is more exposure and no hazard is demonstrable, there should be no hazard with less exposure.

The issue of whether a specific quantity of a substance is harmful may take years to resolve. The classic example of a substance not known to be harmful until after a considerable period of time is asbestos. High concentrations of asbestos dust were known in the

[2]H.H. Wang and B. MacMahon, "Mortality of Pesticide Applicators," *Journal of Occupational Medicine* 21 (1979): 741-744.

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1930s to be hazardous, and the occupational health field had generally agreed upon a safe limit for asbestos workers. However, in 1965 it was shown that very low concentrations of asbestos fiber in the air breathed by a worker handling products containing asbestos may result in disease 20 or more years after exposure.

We recognize that conventional wisdom may turn out to be in error. The presumption was that incorporation of asbestos in a material at 15 percent so bound the asbestos that it was then safe to handle. It was also believed that once a person was removed from exposure to asbestos dust, it would eliminate any further risk. Ex-smokers over time tend to return to the level of risk of non-smokers, so why not other substances? Moreover, before the mid-1960s, it was difficult to identify a large enough group with a specific exposure who could be followed long enough for the hazard to become evident.

So, at a specific time, we may not know whether a substance newly introduced into the environment can be harmful. Often all we have are either indications of a potential hazard, or subpopulation studies that do not reveal the presence of a hazard under the specific conditions of exposure. In most cases, harm can only be determined when we can find evidence in the specific environmental situation that the presence of the substance is harmful.

Has Harm Occurred?

In answering my third query, I will focus only on harm as it relates to human health. In order to do this, we must consider the question of how to measure health.

Health can be a sense of well-being, as well as physical functioning or freedom from disease. Health is seldom measured; ill health is easier to detect. Ill health may be measured by reduced productivity, lost time from work, measurable aberrations in laboratory studies of specific organ systems, incidence of disease, and alteration in life expectancy.

Generally, ill health is viewed as the interaction of one or more disease-producing agents with a specific host under specific environmental conditions. One or more body systems is stressed beyond the point of normal functioning and reflected in recognizable physiologic abnormalities.

The causative agents of many diseases are still unknown. We have no idea in most cases what causes arthritis, why certain people handle emotional stress the way they do, why cells become

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cancerous, why certain neurological diseases occur, or why mental processes sometime slow down with age.

The best information we have about some diseases is that they are associated with certain events. An increased incidence of heart disease is related to high blood cholesterol. Down's syndrome is more frequent as a mother's age increases. Diabetes seems to occur in certain families. Breast cancer is more prevalent among affluent whites.

The evidence is quite persuasive that certain substances are associated with increases in certain diseases. Mercury exposure can cause mental illness, hence the Mad Hatter in *Alice in Wonderland.* Cigarette smoking increases the risk of lung cancer. Exposure to a variety of dusts results in change in pulmonary functions.

In all these examples, the evidence of an adverse influence is demonstrated by a quantitative change in the incidence of a disease in specific population groups. So in order to demonstrate that a substance is harmful to human health, one must be able to show an aberration in the normal state of affairs.

In order to determine what is considered normal, one must either monitor disease and mortality rates or compare population groups. Here is where we have problems. The monitoring of health status in this country has not been completely satisfactory. We have been collecting mortality data by cause in a somewhat uniform fashion since about 1930. The accuracy of data on cause of death, however, is dependent both on the accuracy of physician records and the accuracy with which it is coded for analysis. While the coding is governed by an International Classification of Diseases, this classification scheme has been continually modified so that only with great care can one be assured that trend lines represent the same disease states.

Detailed data suitable for analysis are generally available only for the United States as a whole. Most states are unable to provide similar detail. With cutbacks in the federal budget, this situation will worsen.

The National Center for Health Statistics also has conducted a health interview survey for a number of years. This is conducted on a sample basis, which limits the utility for data referrable to localities. With current concern for the impact of the occupational environment on health, one would hope there would be occupation-specific data, but this is not the case. Similarly, urban-rural differences in varying parts of the country would be useful.

The one noteworthy attempt to provide small-area data was the

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National Cancer Institute's *U.S. Cancer Mortality by County*[3] in which sex- and race-specific, age-adjusted death rates were determined for a series of types of cancers for each county in the United States for the period from 1950 to 1969. Since a decade has passed since these data were collected, changes in rates on a small-area basis would be most helpful.

It would be helpful because overall death rates and death rates from nonrespiratory cancer in the white population have been falling over the past several decades. (See Figures 1-4.)[4]

The data represented in these figures are gross, but they provide the backdrop for reviewing environmental effects on health. We are in a period of generally improving mortality. Thus, not only from the legal, but the scientific point of view, the burden is placed on the complainant to show that in fact harm in terms of altered mortality experience is being caused by a substance introduced into the environment.

Adverse environmental influences so far appear to be confined to specific diseases in a very limited geographic area or with a very limited segment of the population. The evidentiary problem is to identify the specific aberration, and compare health status from one area to another. Not all attempts to do so are successful, as illustrated by the following instances.

A few years ago a study was published which purported to show a higher mortality rate for specific types of cancer in those counties of Ohio using surface water (i.e., from rivers and lakes) as their principal source than in those using deep wells.[5] The presumption was that surface water supplies were more susceptible to pollution.

A case was brought against a manufacturer of carbon tetrachloride who allegedly spilled some of the substance into the Kanawha River in excess of that permitted under regulations in effect at the time. It was contended that even the amount permitted was hazardous to the populations along the Ohio River into which the Kanawha empties.

Data to examine cancer mortality rates along the Ohio River were developed by reviewing not only the data for the counties bordering the river but also along Lake Erie and the principal cities in the cen-

[3] U.S. Department of Health, Education and Welfare (NIH), *"U.S. Cancer Mortality by County, 1950-1969"* (Washington, D.C.: U.S. Government Printing Office, 1974), pp. 74-615.

[4] S. Shindell, "The 'Hazardous' Environment — A Commentary," *Journal of Occupational Medicine* 25 (1981): 198-201.

[5] R.J. Kuzma, C.M. Kuzma and C.R. Buncher, "Ohio Drinking Water, Source and Cancer Rates," *American Journal of Public Health* 67 (1977): 725-729.

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FIGURE 1
AGE-SPECIFIC DEATH RATES PER 100,000 WHITE MALES AGE 15 AND OVER FROM ALL CAUSES U.S. 1940—1975.
(IN ORDER TO OBTAIN FIVE-YEAR INTERVALS FOR THE EARLIER YEARS, VALUES WERE DERIVED BY INTERPOLATION.)

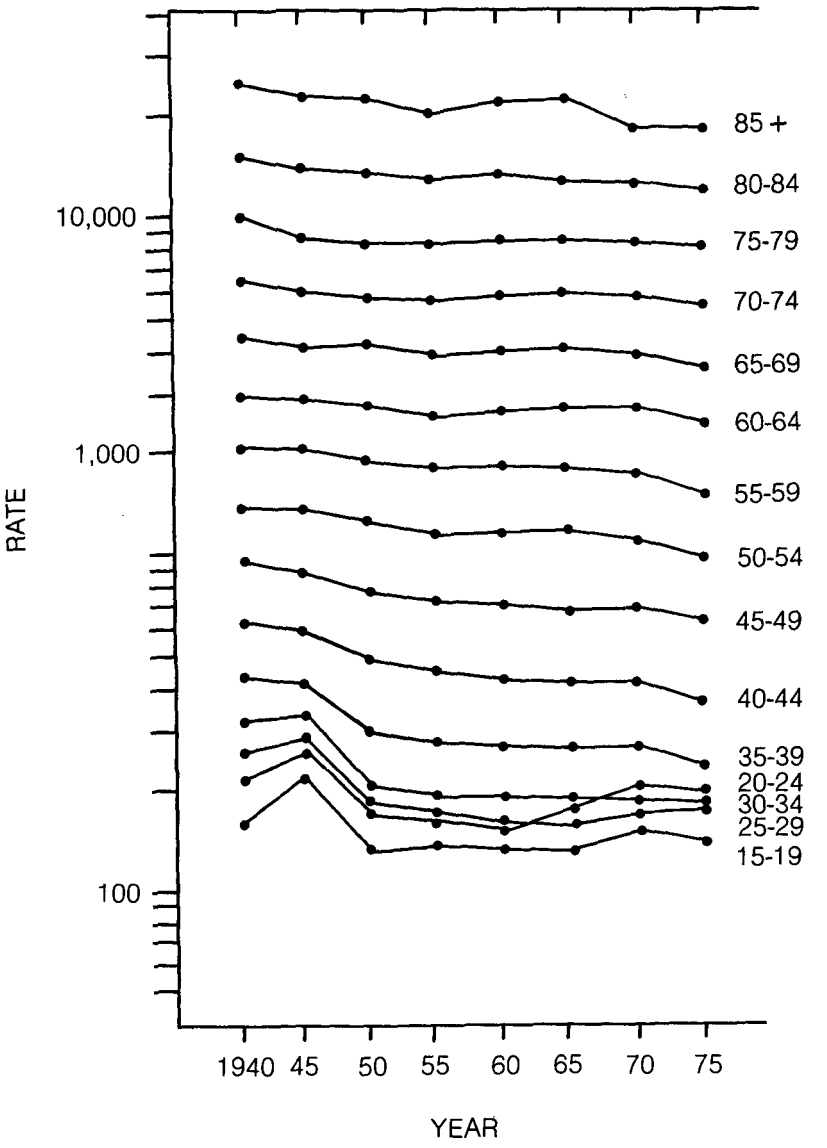

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FIGURE 2
AGE-SPECIFIC DEATH RATES PER 100,000 WHITE MALES AGE 15 AND OVER FROM NONRESPIRATORY CANCER U.S. 1940—1975.

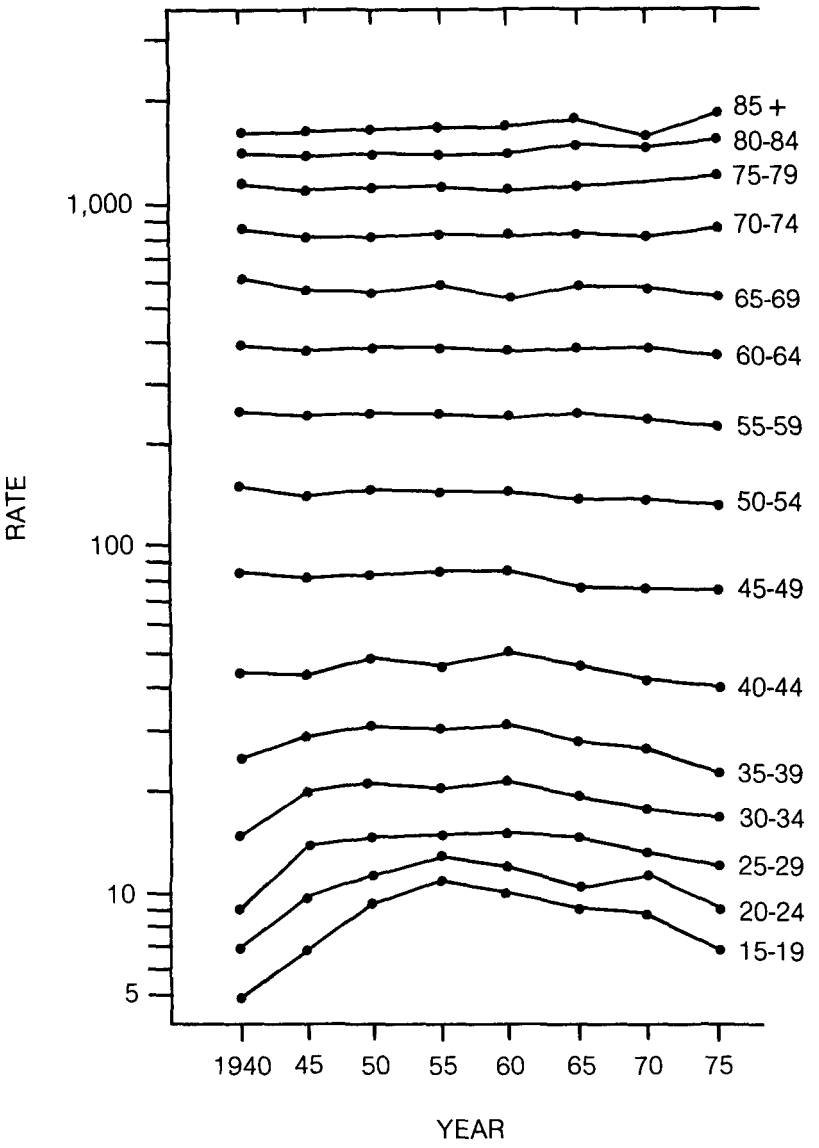

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FIGURE 3
AGE-SPECIFIC DEATH RATES PER 100,000 WHITE FEMALES AGE 15 AND OVER FROM ALL CAUSES U.S. 1940—1975.

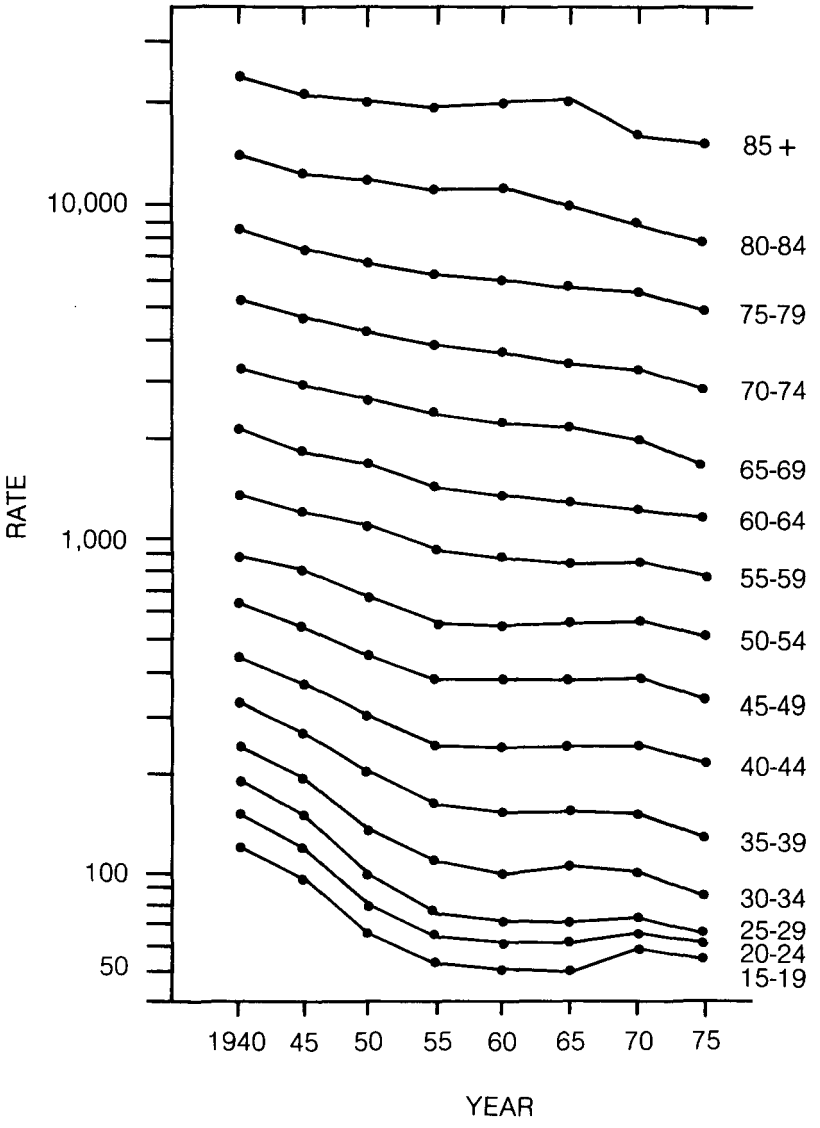

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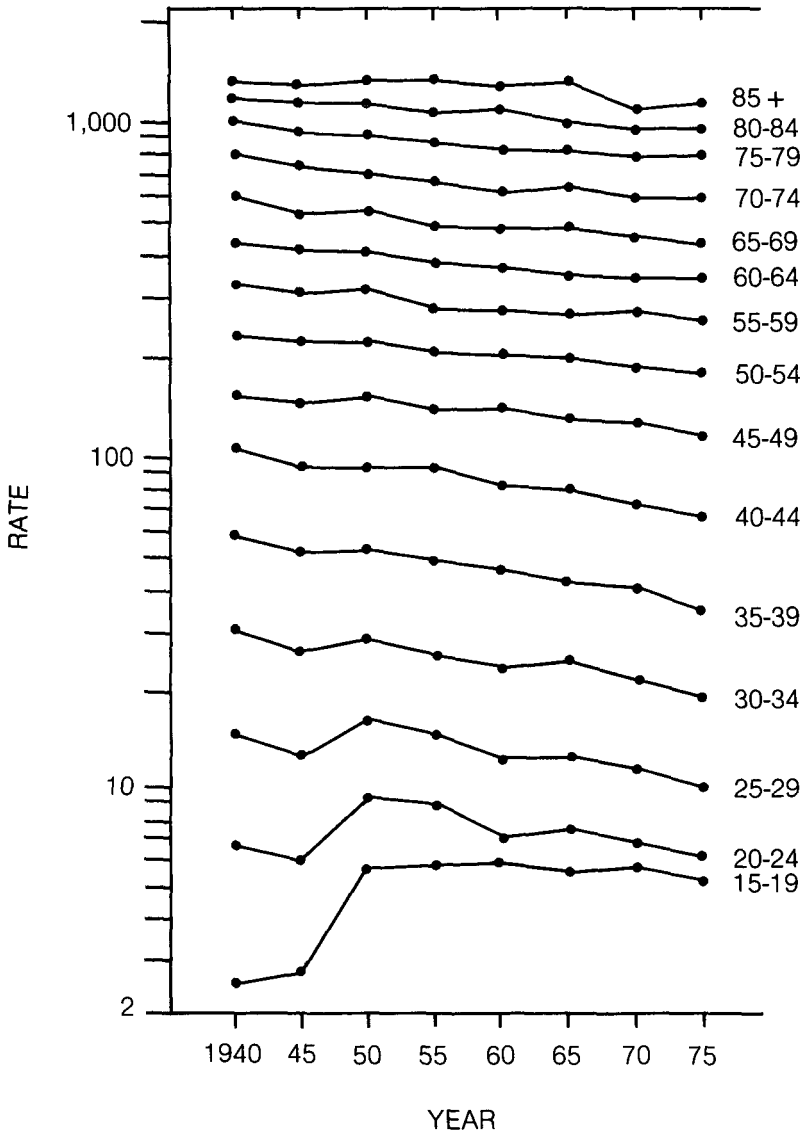
FIGURE 4
AGE-SPECIFIC DEATH RATES PER 100,000 WHITE FEMALES AGE 15 AND OVER FROM NONRESPIRATORY CANCER U.S. 1940—1975.



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tral part of the state.[6]

As Table 2 shows, the Ohio River counties have a generally lower cancer mortality rate than either of the other two groups. Steubenville, which has the second highest overall cancer rate of the Ohio River group, is actually upstream from the point where the Kanawha joins the Ohio, and could not have been affected by its waters. The county with the highest rate is the one in which Cincinatti is located. Located the farthest downstream, the substance would be more diluted than anywhere upstream.

Another instance involves a hearing on air pollution in West Virginia.[7] The contention was that the concentration of chemical plants in the area around Charleston was responsible for an adverse cancer death rate. To examine this question, the NCI study of cancer death rates by county was consulted, and a list of cities with an appreciably greater level of cancer mortality was prepared. (See Table 3.)

This table shows that at least for the 20-year period covered in the NCI report, for white males the age-adjusted cancer mortality rate in Charleston was below the national average and considerably below a number of cities without any heavy industry.

In neither of the examples was the question of the presence of harm in a specific circumstance answered directly. As we know, this is often very difficult to do. In both examples, inferences had to be drawn from comparative data.

We face increasing concern over pollution within a community and must look for variations of health measurements in specific population groups in a limited geographic area. Data are seldom readily available and are time-consuming and costly to develop. Yet the techniques for doing so have been known for a long time. A classic example is Dr. John Snow's study of the cholera mortality rate among users of different water supplies in London in 1854. (See Table 4.)[8] To obtain his figures, Snow not only had to allocate death registrations to specific addresses but also had to identify the source of water in each of the houses in the specific areas studied, primarily by canvassing the households.

[6] S. Shindell, unpublished data. (Presented in Federal Court, Prakersburg, W.Va., September 1977.)

[7] S. Shindell, unpublished data. (Presented at hearing of West Virginia Air Pollution Control Commission, 1 June 1979.)

[8] J. Snow, *On the Mode of Communication of Cholera*, 2d ed. (1854). Excerpts reprinted in S. Shindell, J.C. Salloway and C.M. Oberembt, *A Coursebook in Health Care Delivery* (Appleton-Century-Crofts, 1976), p. 456.

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TABLE 2

CANCER MORTALITY (AGE-ADJUSTED RATES) IN SELECTED OHIO COUNTIES, 1950—1969

	All Sites (white male)	Stomach (white male)	Bladder (white male)	Stomach (white female)
Lake Erie Counties				
Cuyahoga (Cleveland)	211.9	20.7	8.4	10.3
Lucas (Toledo)	196.4	15.8	8.8	6.7
Lorain	189.7	20.2	7.5	9.8
Erie (Sandusky)	189.0	13.5	6.7	6.2
Lake	185.9	18.4	6.6	8.2
Ottawa	179.1	17.7	10.8	6.6
Ashtabula	178.5	21.8	6.9	10.4
Sandusky	158.3	10.8	5.8	6.5
Median	187.5	18.1	7.2	8.0
Ohio River Counties				
Hamilton (Cincinnati)	203.8	12.6	8.8	6.3
Jefferson (Steubenville)	185.7	19.3	5.8	8.6
Lawrence (Ironton)	175.8	15.0	7.3	7.3
Scioto (Portsmouth)	173.7	15.6	4.9	7.8
Clermont	170.3	11.0	6.3	5.4
Brown	142.6	12.5	5.2	4.5
Gallia	140.9	9.3	3.8	4.2
Adams	130.4	10.2	5.0	4.7
Median	172.0	12.6	5.5	5.8
Other Counties with Major Cities				
Mahoning (Youngstown)	203.0	23.1	6.5	11.0
Trumball (Warren)	186.6	19.1	7.0	9.0
Franklin (Columbus)	186.4	12.3	6.7	5.9
Summit (Akron)	185.5	16.2	8.0	8.2
Montgomery (Dayton)	175.9	11.7	6.9	6.2
Stark (Canton)	173.7	15.8	7.2	6.9
Clark (Springfield)	171.1	11.5	7.0	5.4
Butler (Hamilton)	163.7	9.6	5.6	5.7
Median	180.3	14.0	7.0	6.6

SOURCE: *U.S. Cancer Mortality by County, 1950-1969.*

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TABLE 3

AGE-ADJUSTED CANCER DEATH RATES IN WHITE MALES (PER 100,000 POP.) IN SELECTED CITIES AND COUNTIES (1950—1969)

CITY	COUNTY	STATE	
Baltimore	—	Maryland	233.3
Boston	Suffolk	Massachusetts	223.3
Philadelphia	Philadelphia	Pennsylvania	221.1
New Orleans	10 parishes	Louisiana	220.2
St. Louis	—	Missouri	220.1
New York	6 counties	New York	215.3
Charleston	Charleston	South Carolina	214.5
San Francisco	San Francisco	California	212.0
Cleveland	Cuyahoga	Ohio	211.9
Detroit	Wayne	Michigan	209.2
Buffalo	Erie	New York	207.0
Chicago	Cook	Illinois	205.9
Providence	Kent & Providence	Rhode Island	205.7
Cincinnati	3 counties	Ohio & Kentucky	204.1
District of Columbia			203.7
New Haven	New Haven	Connecticut	203.6
Milwaukee	Milwaukee	Wisconsin	203.2
Wheeling	Ohio	West Virginia	203.1
Youngstown	Mahoning	Ohio	203.0
Pittsburgh	Allegheny	Pennsylvania	202.1
Weirton	Hancock	West Virginia	200.7
Charleston	Kanawha	West Virginia	172.3
United States			174.0

SOURCE: *U.S. Cancer Mortality by County, 1950-1969.*

Snow was concerned with only one disease. Today we are concerned with deaths from a variety of causes as well as other measures of harm, such as the influence of a possible pollutant on mental functioning, on the ability to reproduce, and on the frequency of congenital malformations.

Since data are limited we must approach each problem almost the same way John Snow did over a century ago. It is possible to develop monitoring systems, but the increasing difficulty of gaining access to the needed information will make our task harder.

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TABLE 4

"PROPORTION OF DEATHS TO 10,000 HOUSES, DURING THE FIRST SEVEN WEEKS OF THE EPIDEMIC, IN THE POPULATION SUPPLIED BY THE SOUTHWARK AND VAUXHALL COMPANY, IN THAT SUPPLIED BY THE LAMBETH COMPANY, AND IN THE REST OF LONDON."

	Number of Houses	Deaths from Cholera	Deaths In Each 10,000 Houses
Southwark and Vauxhall Company	40,046	1,263	315
Lambeth Company	26,107	98	37
Rest of London	256,423	1,422	59

Did the Pollutant Cause the Harm?

Basically, if the first three questions have been answered affirmatively, the last question — "Is there evidence that the harm is the result of the substance that was introduced?" — is a matter of presumption. If we had shown that a substance had been introduced into a population subgroup and that the substance is capable of producing harm, and in fact such harm is present in the subgroup, we may conclude that we have shown the harm present to be due to the substance that was introduced.

The matter may not be quite so simple, however. Often we may demonstrate that the presence of pollution and of harm are associated geographically or in time, but this does not necessarily mean that one has caused the other.

The major problem in determining whether there is a causal relationship between a hazard and a health effect is that most health effects occur to some degree whether or not the hazard is present. A health effect is only causally related if:

(a) it would not be expected to occur in the absence of the hazard; or

(b) it would not have occurred with the frequency experienced had it not been for the presence of the hazard.

We are fairly comfortable in suggesting causal relationships in the case of unusual diseases. The observations that angiosarcoma occurred in vinyl chloride workers and mesothelioma in asbestos workers led to the conclusion that the disease and the exposure

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were related because of the extreme rarity of these conditions in the general population.

It is also easier to assume a causal relationship when a health effect is dramatic, such as in the smog experiences in London, England and Donora, Pennsylvania. There people died from "ordinary" diseases, but in obviously excessive numbers.

In the absence of these conditions, however, it is much more difficult to demonstrate that a negative effect is caused by pollution. The best we can do is monitor and analyze indices of ill health on a continuing basis and watch for change. This will allow us to associate changes in pollution with measures of ill health, and to evaluate the effectiveness of our abatement technology.

It is interesting that while many individuals presume pollution, per se, is hazardous and should be abolished, others note that its elimination is neither technically possible nor efficient. We could never achieve a perfectly clean environment, nor would it be efficient to aim at such a policy goal. Resources for pollution abatement are scarce and subject to the principle of diminishing returns.

In the limited environment of the workplace, we have been able to determine threshold limit values for the more common substances. Individual workers may be monitored for acute manifestations of toxicity, but industries rarely maintain a formal monitoring system that systematically aggregates the data concerning the individual workers. The absence of such a system means we shall continue to be unable to resolve the evidentiary problems posed in this paper.

Techniques for precise monitoring are available.[9] If done appropriately, an employee health surveillance system can be cost-effective not only in minimizing on-the-job injury and illness but also in increasing productivity and reducing costs of Workers' Compensation and health insurance. A health surveillance system can also provide data for defense of unwarranted compensation and product liability claims.

Techniques to monitor the health of the general population also exist but are not sufficiently utilized. There is a mechanism to monitor mortality, but it has its shortcomings. Age-specific mortality rates by cause for the United States do not become available until three years later. Except for rough figures for rates, there are no trend lines, and data for states, regions, and cities are not produced. Data have been collected to perform such analyses, but no commit-

[9] S. Shindell and H.M. Goldberg, "Surveillance Systems: What to Include and Why," *Occupational Health and Safety* 50 (1981): 34-56.

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ment has been made by the National Center for Health Statistics. Their official policy is that they are responsible for collection, not analysis, yet without analysis there is little rationale for data collection.

Conclusion

This paper has investigated the evidentiary problems relating to causation and harm in pollution-engendered torts. I have suggested ways to improve the collection and use of data pertaining to potentially harmful substances. I conjecture that as our monitoring techniques improve, we will find that our past performance against pollution has been tolerably good. Meanwhile, such improved monitoring ought to promote the health of our population, because with early detection significant harm can be avoided from hazardous wastes.

Finally, I suspect that a new source of liability is about to arise. Negligence exists when one knows or should have known of the presence of a hazard. As the technology becomes available to conduct stricter monitoring of the environment, it seems plausible that actions will be brought for failure to institute a surveillance system that could have warned of a potential hazard in a specific environmental circumstance.

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FIVE ISSUES OF CAUSATION AND PROOF

Randy Barnett

In any discussion of causation in torts cases in general and pollution-engendered torts cases in particular it is necessary to distinguish two types of inquiry. The first is the nature of causation in torts; that is, what do we mean when we say that one person causes harm to another? Given an answer to this question, the second inquiry is how we demonstrate the causal connection in practice; that is, how do we prove that a particular activity by one person has caused a certain harm to another? It seems fair to say that while causal questions of the first sort are not more vexing in pollution cases than in most other types of torts cases, the second kind of inquiry can present quite serious and sometimes intractable difficulties.

With this distinction in mind, Professor Shindell's paper[1] can be seen as a provocative exploration of some problems faced by those attempting to demonstrate a causal link between a particular pollutant and a subsequent health effect. In my comments I will attempt to put his analysis in the context of five common legal issues of causation and proof. The first is the concept of causation employed in the analysis. The second is the nature of the evidence used by Professor Shindell. The third is the standard of proof that should be applied. The fourth is the question of who should bear the burden of proof. Finally, I shall briefly consider the need for a causal requirement. Though I will not here attempt to conclusively resolve these issues, much confusion will be avoided if they are kept in

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[1]Sidney Shindell, "Evidentiary Problems in Pollution-Engendered Torts" *Cato Journal* 2 (Spring 1982): 137-155.

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mind when discussing problems of environmentally engendered torts.

The Nature of Causation

In the course of his excellent discussion, Professor Shindell makes an observation that if taken seriously can only result in causal problems becoming more acute than necessary. Concerning the nature of the causal relationship between a health hazard and a health effect, he says:

> A health effect is only causally related if:
>
> (a) it would not be expected to occur in the absence of the hazard, or
>
> (b) it would not have occurred with the frequency experienced had it not been for the presence of the hazard.[2]

This characterization of the causal issue is a form of the well-known "but for" test of causality.[3] Professor Shindell might have said, "But for the hazard, a health effect would not have occurred as frequently." Notice, as Professor Epstein has pointed out, that this expression "is in counterfactual form and requires an examination of what *would have* been the case if things had been otherwise."[4] It does not ask the more straightforward question of what caused the health effect being considered.

The problem created by such a formulation is that it fails to identify the agent causally responsible for the health effect. On this view any occurrence that was a necessary condition for the health effect is a cause of the effect. Thus, in the case of water pollution, were it not for the consumption of the contaminated water no health effect would have occurred. Is the drinking of contaminated water to be considered a "cause" of the same order as the existence of the contamination? The "but for" test cannot distinguish among necessary conditions, and efforts to identify the "proximate" cause have met with little success.[5]

[2]Ibid., p. 153.

[3]See generally William L. Prosser, *Handbook of the Law of Torts,* 4th ed. (St.Paul, Minn.: West Publishing Co., 1971), pp. 236-244.

[4]Richard A. Epstein, "A Theory of Strict Liability," *Journal of Legal Studies* 2 (1973): 160.

[5]See ibid., pp. 160-189; idem, "Causation and Corrective Justice: A Reply to Two Critics," *Journal of Legal Studies* 8 (1979): 477; see generally H.L.A. Hart and A.M. Honore, *Causation of the Law* (London: Oxford University Press, 1959); Prosser, *Law of Torts,* pp. 244-289.

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This type of counterfactual concept of causality is unnecessary. The statement, "asbestos-caused mesothelioma" needs no more linguistic reformulation than "arsenic-caused death" or "the blow caused a broken nose." Though the factual chain of causation could be very long indeed, the causal paradigm operating in pollution cases is simply, "A poisoned B." It should be stressed that such a change in the causal language Professor Shindell has employed would not affect the merit of his analysis. What he is observing in this passage is the fact that the only evidence of a causal link between the hazard and the harmful effect may be a statistical association. It is to this issue that I now turn.

The Nature of Causal Evidence

The causal link between the defendant's conduct and the plaintiff's injury is a fact that must be proved in every action in tort. The evidence offered in proof may be of two kinds: Direct and circumstantial. Direct evidence proves the fact in issue without reference to any intermediate inference. Most often it takes the form of eyewitness testimony to the effect of "I saw A hit B in the nose." This is direct evidence of the identity of B's assailant and the nature of the attack. Of course it may be believed or disbelieved by the trier of fact. If accepted as true, however, these facts are, without more, proved. Circumstantial or indirect evidence is evidence of facts that together with other proof or reasonable inferences can be indicative of a fact in issue — here causation. An example of circumstantial evidence is a fingerprint found at a crime scene that might indicate presence, but not time or circumstances. It should not be assumed that one form of evidence is inherently more reliable than the other. Often circumstantial proof will be preferred to eyewitness testimony.

It is unlikely that causation in cases of poisoning or pollution could ever be other than circumstantial. Even if a witness saw A pour arsenic into B's tea, the fact that B's subsequent death was caused by the arsenic would need to be inferred from an examination of B's remains. And the degree of certainty with which such a conclusion can be made will depend upon the strength of the direct and circumstantial evidence as well as upon the extent of our understanding of the effect of arsenic on the human body that permits us to make inferences from the circumstances. It should not be thought that causal questions are unique in this regard. A person's state of mind must almost always be inferred from that person's

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behavior, though factual presumptions are also employed.[6]

The evidence that Professor Shindell advances as proof of causation in pollution cases takes the form of statistical associations, which are (given certain epistemic assumptions) one kind of circumstantial evidence. When should this type of evidence be allowed to supplement or substitute for direct proof of causation? If our answer is *never,* then we are in effect granting immunity to most polluters for whatever harm they may cause. If our answer is that *any* association will always be dispositive, then we will inevitably enjoin industrial activities that are not in fact harmful. Assuming that statistical associations may be a way of discovering the existence of a causal link, and further, that the strength of any such inference will depend on the degree of association, then we must determine what degree is sufficient for a finder of fact to conclude the existence of the causal link. What should be the standard of proof?

The Standard of Proof

The standard of proof to be adopted in a given type of case will depend on the nature of the interests that would be affected by an incorrect decision. So even if we believe, as I do not, that it is sometimes justified to protect persons from harming themselves by the consumption of some chemical like nicotine or saccharin, we may be unwilling to do so on the basis of a "mere" statistical association between consumption and the incidence of cancer in humans or more attenuated inferences drawn from the results of tests on other animals. In the case of an involuntary ingestion[7] of the same chemical, however, our standard might differ and such evidence be allowed. When the interest affected is individual liberty, as it is when the sanction is imprisonment for a crime, the standard adopted is a high one, but not one that guarantees no error.

The problem posed by pollution cases, indeed all private tort actions, is that a decision in favor of one party will be a decision against the other. Assuming our law is based on individual rights, an erroneous judgment will unjustly restrict the losing party's liberty. To place a greater burden, then, on one party than the other would seem to provide a greater protection for the rights of the party with the lesser burden. All things being equal, we should place

[6] We say, for example, that a person is presumed to intend the natural and ordinary consequences of his or her actions as a matter, perhaps, of introspective insight.
[7] E.g., poisoning cases of which pollution cases may be considered a species.

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the same standard of proof on all parties. But all things are not equal. The standard of proof will depend on factors apart from the seriousness of the interests at stake.

Standards of proof that amount to a (rebuttable) presumption in favor or against finding a particular fact to be true will also depend on our common understanding of the world. Hence, if we believe that in most instances chemicals released into the environment will not cause adverse health effects or if we believe that the chances of a particular act of pollution being responsible for a given injury is quite low, we may adopt a presumption to that effect. In doing so we are saying that recovery may be allowed provided the plaintiff demonstrates the truth of his or her claim beyond a certain level of doubt.

This type of analysis can help account for and justify a different standard of proof in judging requests for damages after a harm has been sustained than is used in cases where injunctive or preventive relief is sought. Surely the standard of "substantial risk of imminent harm" applied to pleas for injunctive relief reflects both our uncertainty about whether a harm will in fact occur if the activity is allowed and an even more fundamental doubt about the feasibility of demonstrating such a fact.

Allocation of the Burden of Proof

Yet a fourth issue must be identified in pollution-engendered torts cases and that is: Who shall be required to produce evidence of a certain fact? Put bluntly, must a plaintiff prove that the defendant's emissions caused or will cause a harm or must the defendant prove this is not or will not be the case? Allocation of this burden will involve both factors mentioned in regard to the standard of proof, but will also depend upon the principle of justice that prohibits individuals from being forced to rectify injuries they haven't caused. Before acting a court will need a reason to single out the defendant, and this reason has traditionally been demanded of the requesting party.[8] More will be said on this point in the next section.

[8]Two aspects of "burden of proof" have been distinguished: The burden of going forward with evidence; i.e., which party must raise an issue by competent evidence and the burden of persuasion; i.e., once raised, which party must satisfy the trier of fact by proof beyond a certain level of doubt. It may, for example, be the rule that a plaintiff must present some evidence indicating that the defendant caused an injury and then the defendant must prove beyond a preponderance of the evidence that he did not. An allocational choice must be made here that will involve much the same concerns outlined throughout this comment.

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The Doctrine of *Res Ipsa Loquitur* and the Need for a Causal Requirement

Res ipsa loquitur as traditionally formulated is not a doctrine that speaks to *causal* issues but one which specifies certain circumstances where the defendant's conduct is rebuttably presumed to be *negligent*. In these cases where it is shown that the defendant's conduct harmed the plaintiff the burden will shift to the defendant, who then must prove that he was not negligent. A case subject to this doctrine is one of *strict liability*,[9] and if this presumption is held to be legally unrebuttable then the theory is one of *absolute liability*. In neither case are causal barriers lowered except in one sense: If a plaintiff must show that defendant acted negligently, it must also be shown that it was the defendant's negligence that caused the harm to the plaintiff. To illustrate this, suppose that while driving my car at twice the speed limit I run you over. If it can be shown that had I been operating the car at normal speed, (i.e., non-negligently), I still could not have avoided hitting you — because of lighting, your clothing, etc. — then on a negligence theory there is no causal link between my speeding (i.e., the negligence) and your injury even though my actions were concededly the cause-in-fact of your injuries, and you will be denied recovery.[10]

In this way *res ipsa loquitur* may limit the more extensive and complicated causal inquiry required by a theory of negligence, but it does not eliminate the need to prove that the defendant's conduct caused the plaintiff's injury.[11]

Persons should not be held liable for harms that we don't or can't know they caused. The problem of limited knowledge is an inherent quality of human existence. We must always operate on less than perfect information. A free society that recognizes individual rights consistent with individual liberty must adopt certain principles of justice, the most important of which is that a person will be free to use and enjoy his or her person and property unless that use invades the equal rights of his or her neighbors. Any proposal that preventively restricts human action or retroactively penalizes individuals for conduct that has *not* infringed on another's

[9] See Epstein, "A Theory of Strict Liability"; idem, "Defenses and Subsequent Pleas in a System of Strict Liability," *Journal of Legal Studies* 4 (1975): 391.

[10] In theory, that is. The bias in favor of strict liability in such cases is so great that even within a nominally negligence system a defendant would be lucky to escape liability absent serious misconduct by plaintiff.

[11] Contra Robert Best and James Collins, "Legal Issues in Pollution-Engendered Torts," *Cato Journal* 2 (Spring 1982): 101-136.

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rights has seriously undermined the very concept of individual liberty. In the absence of proof to the contrary, we must presume that one person's conduct is not invasive of another's rights if we wish to remain a free society. There is no middle course.

Conclusion

It is important to be aware that decisions concerning the five issues of causation and proof raised here must be made and that any decision reached will favor one party at the expense of the other. Ultimately, these issues must be resolved by an appeal to notions of how the world works, how we come to understand it, and where justice lies.

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CAN WATER POLLUTION POLICY BE EFFICIENT?

Jerome W. Milliman

Introduction

In 1972 Congress established the Federal Water Pollution Control Act in which the Environmental Protection Agency was given responsibility to "restore and maintain the chemical, physical, and biological integrity of the nation's waters." Two national goals of "swimmable and fishable" in 1983 and "zero-discharge" in 1985 were set forth.

The 1972 law set up a national permit system for direct regulation of discharges from industrial and municipal sources, making it illegal to discharge wastes from point sources without a permit. The permit states discharge limitations for specific pollutants, establishes schedules for upgrading controls, and requires monitoring and periodic reports. As of February 1980 a total of 58,907 permits had been issued (15,395 municipal dischargers and 43,512 nonmunicipal dischargers).

Municipal dischargers were required to achieve a level of secondary treatment by 1977 and all other dischargers (mostly industrial) were required to use the "best practical control technology currently available" (BPT) by the same date. By 1983 municipal plants were to achieve BPT and industrial dischargers were to achieve "best available technology economically achievable" (BAT) in order to progress to the national goal of eliminating discharges of all pollutants. Note that the emphasis is on emissions from point sources. EPA was given no specific authority to regulate pollution from nonpoint sources.

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As of 1980, EPA reported that the industrial dischargers had a compliance rate of 80 percent. By contrast, municipal dischargers have been slow to comply despite being eligible for construction grants, with a compliance rate of 40 percent with the 1977 requirements. In February 1980, EPA estimated that 63 percent of major municipal treatment facilities were not yet in compliance with the original July 1977 deadline. By the end of 1979, EPA had obligated $24.4 billion in construction grant appropriations (75 percent of construction costs) to municipalities for sewage treatment plants. Construction had begun on 6,623 projects but only 1,552 were in operation. EPA inspections of operating municipal sewage plants reveal that less than one half perform satisfactorily because of operation and maintenance problems. Apparently, EPA is in a poor bargaining position with reluctant municipalities to require compliance because of lack of effective sanctions.

In the last decade some success in the control of water pollution has been achieved. A few areas have seen some dramatic improvements. Many industrial point sources of pollution are now under control, but municipal sources remain a serious problem. Moreover, more than half of all pollutants are coming from nonpoint sources that are currently uncontrolled. The most important nonpoint sources are urban storm runoff and runoff from agricultural activities. Also, toxic pollutants in surface and ground water are a major concern. For example, even though salmon are returning to the mouth of the Hudson River after a 75-year absence, they should not be eaten because of high PCB (polychlorinated biphenyls) contamination. Also, many states are finding synthetic organic compounds in wells of public water systems.

With the adoption of a program based almost exclusively on direct governmental controls, with almost no reliance on economic tests for efficiency, and with no reliance on private property and market-type approaches, no one should expect a favorable outcome. Congress has established a complex and cumbersome program of detailed regulation with a set of goals that fail to include economic scrutiny of benefits and costs. Most observers conclude that water pollution control programs in the United States are expensive, largely ineffective, and wasteful. This is ironic because the rationale for public intervention in the control of water pollution is to combat the inefficiency caused by unregulated use of water resources.

This paper will assess three instruments for management of water pollution: Direct regulation, effluent charges, and tradable

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permits and the role each can play in achieving efficient water pollution control. We will look at the failure to estimate benefits stemming from present policies and possibilities for more reliance upon market mechanisms and property rights in efficient water pollution policies. Finally, we will focus on the need to adopt policies that deal with management of nonpoint sources, groundwater protection, and the control of toxics. These areas tend to be neglected in a policy aimed largely at controlling point sources of conventional pollutants in surface waters by direct discharge regulation.

Defining Pollution

Pollution can be defined as damage to the services provided by the environment caused by the disposal of residuals from production or consumption activities. The discharge of residuals includes heat, noise, and damage to aesthetics as well as the discharge of solids, liquids, or gaseous materials. We will be concerned with the pollution caused by the actions of man although it is clear that the actions of nature also cause the emission of materials into the environment that can reduce its services. Air pollution from volcanic action is well-established. Likewise, natural oil seeps can cause damage to aquatic food chains.

The cost (or damage) of pollution is the value of environmental services foregone by the disposal of residuals. The damage to the environment is both a function of the volume of discharge in relation to the assimilative capacity of the environment and the location of the use of that environment (primarily by the location of receptor activities). In other words, if there is little stress on the assimilative capacity or if there are few activities harmed, the damage will be small.

Four Steps in Estimating Pollution Damages

Four steps are required to go from estimates of water pollution discharges to dollar estimates of damages. Each step involves information gaps and measurement error, and the level of ignorance increases with each step. As can be seen from Figure 1, pollutants like conventional biochemical oxygen demanding substances (BOD) or toxic pollutants such as asbestos, benzene, or mercury are first shown as emissions. We then progress to ambient water quality in streams, lakes, or underground waters. Changes in ambient quality

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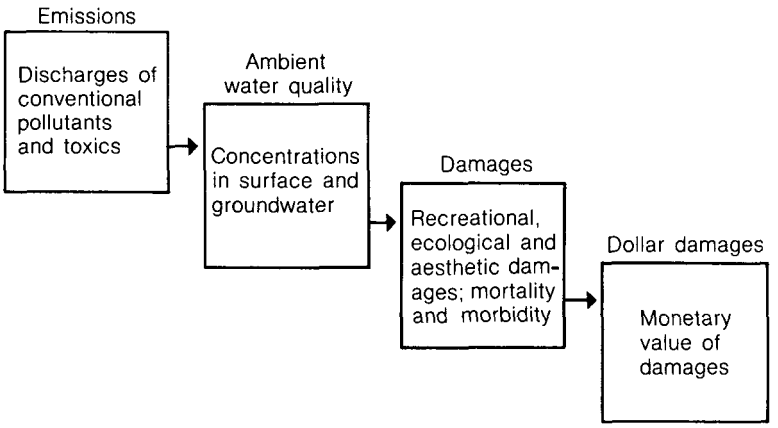
produce damaging effects on humans, plants, wildlife, and property. Step three involves identifying an adverse effect and attributing it to the change in ambient quality; i.e., specifying the dose-response function. In step four the researcher attempts to put a dollar value on the damages sustained from water pollution or, conversely, on damages averted by pollution abatement.

FIGURE 1
STEPS IN ESTIMATING POLLUTION DAMAGES



Steps one and two involve the assembling of data on emissions and on ambient quality from both point and nonpoint sources for various surface waters and for ground water. The problems associated with water quality data are immense — the sparsity of data, nonrepresentative monitoring sites, and limited detection capability for some pollutants make for poor data quality. There is also a lack of coordination across programs. A federal task force found more than 100 water monitoring programs managed by 20 federal agencies, which spent approximately $275 million in 1978 (CEQ 1980). State and local monitoring were not studied.

Surface waters are visible and tend to be better monitored. Less visible ground waters finally are receiving attention because of contamination from toxic organic and inorganic chemicals. Because ground water is widely used for drinking water, infiltration of toxic chemical pollutants may be posing health risks. Only recently has EPA instituted a statistically designed monitoring survey for ground water.

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Nonpoint sources of water pollution are ones where there is no obvious outfall or pipe for discharge. Nonpoint sources are diffuse, difficult to identify and to control. The most important nonpoint sources are runoff from agricultural operations, urban storm runoff, runoff from mining and forestry activities, and from individual septic systems. The General Accounting Office has found that more than one half of all water pollution is from nonpoint sources (GAO 1977). Yet the Clean Water legislation and economic literature devote little attention to this problem. More control of emissions from point sources may do little to improve ambient quality where nonpoint pollution is serious.

Using U.S. Geological Survey (USGS) data and EPA water quality definitions, the Council on Environmental Quality (CEQ 1980) analyzed six pollution indicators in rivers and streams. The pollution indicators were for fecal coliform bacteria, total phosphorus, dissolved oxygen, total cadmium, total lead, and total mercury. The results showed little or no change in ambient water quality from 1975 through 1979. This has been interpreted as "good news" since population and gross national product increased during the period. However, it appears that EPA criteria for swimming and preservation of aquatic life were frequently violated by the indicators.

In step three it is fair to say that the range of uncertainty about dose-response functions is large. There is considerable debate about the existence of thresholds and factors of safety. Responses vary greatly among individuals, property, and plant and animal species. Long-term and short-term exposures cannot be equated. Also, epidemiological studies are scarce.

With regard to damages caused by low ambient quality, the usual practice is to employ thresholds developed by EPA for water quality and to assume that violations of these thresholds cause damages. However, the extent or quantitative measure of the damages resulting from violations of thresholds and standards is not known. That is to say, *reliable measures of total damages stemming from water pollution by region or by watershed do not exist.* Furthermore the thresholds developed by EPA are not universally accepted. In its study of water quality conditions for surface water, CEQ used annual median concentrations for 1975 to 1979. Although annual median concentrations may be useful to pick up violation rates for thresholds, such data do not say very much, if anything, about the actual extent of damages. The thresholds themselves appear to be related, for the most part, to the preservation of aquatic life. Yet data on damages to aquatic life resulting from these threshold viola-

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tions in the field do not exist.

Step four involves putting dollar values on damages sustained from water pollution or, conversely, on damages averted by pollution abatement. As one might expect from the discussion of damage estimates in step three above, *there exist no credible estimates of the overall benefits being conferred by the federal water pollution control program.* In this context, Mills (1978, p. 128) has stated: "It is incredible that an expensive national program has been undertaken with almost no analysis of the benefits it will confer on society."

It is generally believed that the major source of benefits from water pollution control will be from enhanced water-based recreation (swimming, boating, and fishing) and aesthetics. A report prepared for EPA in 1976 using 1973 dollars, but estimating benefits of water pollution control upon hypothetical conditions expected to prevail with use of best available technology and zero discharge in 1985, found that annual benefits would be $10.1 billion a year from eliminating all water pollution. More than 60 percent of all estimated benefits were from recreation. Ackerman et al. (1974) examined proposed recreational benefits from cleaning up the Delaware River and found them to be trivial in comparison with the costs. Freeman (1979) points out that there is a substantial body of research on estimating demands for outdoor recreation, but little work has been done on the role of water quality in influencing the demand for recreation. Because of insufficient evidence no one has attempted to estimate the health benefits from the elimination of possible chemical contamination in drinking water.

A complete economic analysis would require a comparison of the benefits with the estimated costs of control. No such study has been made. We cannot even find an estimate of the total costs of water pollution control to date. CEQ (1980, p. 394) estimates that annual costs for "incremental" (the increase in spending because of new regulations) federal water pollution abatement were $12.7 billion for 1979 alone. The cumulative estimate for 1979-1988 was given as $169.7 billion for federal programs and $250 billion for all federal, state, and local regulation.

As far as we can tell, these future cost estimates are largely for control of point emissions with virtually no attempt to cost out control of nonpoint emissions. There are two aspects of the omission that need to be stressed. First, costs for control of nonpoint emissions are likely to be high. Second, unless we control nonpoint emissions, the incremental benefits of increased control of point emissions may not be very large.

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Already, we have seen that the control programs on point emissions through 1979 have not improved water quality as conventionally measured. Regional improvements in some areas are evident, but on a national level, the best we can conclude is that surface water quality has not deteriorated in the face of growth in population and GNP in the period 1975 to 1979; in other words, national water quality is virtually unchanged. One must be skeptical that a continuation of present programs of expenditure and control for point emissions will lead to dramatic improvements by 1983, 1985 or 1988. It now appears that the EPA's report (1976) on benefits to be forthcoming in 1985 from zero-discharge was based upon conditions not likely to be reached in 1985 or perhaps ever. More importantly, it is not at all clear what is meant by zero-discharge considering the magnitude of nonpoint problems. Given the large expenditures involved in pollution control, there is a good case for benefit estimates. Why is there so much reluctance to get on with the task?

Causes of the Pollution Problem

A key assumption in our discussion of damages from water pollution is that social welfare is to be judged by individual needs and wants. This value judgment is central to our examination of the role of private markets and government in providing the water quality demanded by society. Acceptable water quality is not now adequately provided for by private markets. It is an example of a good for which people may not be able to judge what is in their best interest because they may have little information on the effects of water pollution.

Government should provide better information about the level of water quality and about the effects of water pollution so that individuals and firms can better make their own decisions. Ignorance on the part of individuals is usually a poor rationale for collective action. In fact, lack of knowledge about levels of ambient water quality and about dose-response functions is also an obstacle to efficient public decision-making as well as individual choice. We wish we could guarantee that public institutions will make fewer mistakes and have better information than market institutions. This pervasive ignorance may be as much of a problem as the question of market failure.

If there are no markets for clean water or if markets for water resources do not function properly, the resulting prices do not con-

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vey correct signals about water quality demand and supply. In general, the water pollution problem is one of economic inefficiency stemming from market failure. There are two relevant sources of market failure, which provide the basic rationale for public policy either to strengthen or to replace markets to determine optimal water quality. However, these sources of market failure may create problems for collective decision-making as well.

The first is the lack of well-defined property rights. Water resources tend to be mobile, and the size of the unit for vesting property rights tends to be very large. This is particularly true for large bodies of water and for river basins crossing state lines. For some purposes, control of a major river system is indivisible. It was argued earlier (Milliman 1959) that state water law could go much further in treating water rights as private property so that water use could be allocated through the market mechanism. Although the reasoning developed at that time applied mainly to the use of water for irrigation, it is clear that water rights could be developed for water-borne waste disposal from point sources and for many aspects of water quality. In fact, where it has been possible to specify water rights through the law of appropriation in some western states, limited markets in water rights have developed that deal at least in part with water quality problems stemming from waste disposal.

The worst water pollution problems in the United States are found in eastern states where development of market mechanisms for water resources has been virtually nonexistent. The major limitations of the water-law approach involve sources of nonpoint pollution, e.g., urban and agricultural runoff and for instream uses where access cannot be controlled. However, as noted above, public policies for pollution control using nonmarket approaches are ineffective on nonpoint pollution problems. If we can develop government regulations for the discharge of emissions of pollutants from point sources, we can develop property-rights and market-type solutions for point sources. All aspects of water resource use do not have to remain inflicted with the common property syndrome.

The second source of market failure stems from water quality as an environmental amenity. Some aspects of water quality, once supplied, are equally available to all. Since users cannot be excluded for nonpayment, there is no obvious way that private producers operating through markets could produce and sell clean water. As a result, the market system will tend to underproduce

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clean water.

This public good aspect of water quality offers no incentives to consumers either. This is the "free rider" problem. Individuals receive a certain level of water quality regardless of what they contribute. The dilemma is how to get people to reveal their preferences for clean water and yet accept responsibility for sharing the costs.

It is not clear just how important the public good aspect really is. Certainly the problem of excludability is much greater in dealing with air pollution than it is with regard to many rivers, lakes, and underground waters that have fairly well-defined flows and locations. This means that ways to control access and segregate uses could be devised for many kinds of "mobile" water resources. Water quality for swimming, boating, and fishing could have some aspects of exclusion and therefore allow market-type mechanisms, to some extent, to determine preferences. Users could be asked to help bear costs and to allocate water quality resources for recreational uses, particularly if waste discharges also had to compete for emission rights. Preserving the aesthetics of a lake or river basin may be the strongest argument for the public good feature. It is possible that aesthetics will be much less of a problem once the question of how much to invest in water-based recreation is decided.

We do not want to push these ideas too far at this point because we want to go into more detail below. It is clear that there are all sorts of problems in dealing with market-like solutions for determining the "optimal" level of water quality. Can property rights be defined with sufficient precision in enough cases to create markets? Can a large number of downstream consumers negotiate effectively with upstream polluters? How should pollution rights be vested? Will the market solutions approximate competitive outcomes? It is clear, however, that once the goal of efficiency is established, the search for clean water strategies will change considerably. The important problem, at this point, is not market versus nonmarket strategies but goals: Do we want clean water at any price or do we want water pollution policies that are socially efficient and subject to careful studies of benefits and costs?

The Efficient Level of Pollution Control

To some people the notion that there is an optimal level of pollution control and therefore an optimal level of pollution is very

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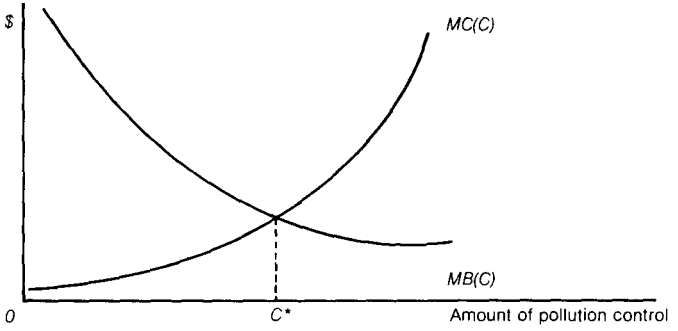
disturbing. Indeed, the federal legislation states: "It is the national goal that the discharge of pollutants into the navigable waters be eliminated in 1985." Holders of this point of view believe that any amount of pollution is undesirable and that it should be eliminated despite enormous social costs.

It is our view that the discharge of residuals is a legitimate economic activity, which is socially undesirable only when the damages exceed the cost of control. Moreover, the label of "pollution" covers a multitude of discharge activities, some of which are far more serious than others. It is nonsense to contemplate the immediate elimination of all forms of pollution. Deadly toxic discharges are a very different matter from discharges of degradable organic wastes into waters having large amounts of dissolved oxygen. Finally, the control of pollution involves the use of scarce resources and opportunity costs. Although pollution control may prevent damages, there can be too much pollution control as well as too little. How far do we go?

Society's willingness to pay for a cleaner environment can be illustrated by a marginal benefit *(MB)* function. The *MB* function shows the marginal damages averted by additional pollution control. Figure 2 shows the relationship between the *MB* function and the marginal costs *(MC)* of pollution control for environmental quality. The socially efficient level of pollution controls is the value C^* where the marginal benefits of control equal the marginal costs of control, or $MB(C^*) = MC(C^*)$.

FIGURE 2
THE OPTIMAL LEVEL OF POLLUTION CONTROL



It can be shown that C^* is the level of control that is socially efficient. If the level of control were to the right of C^* the increase in control costs would exceed the increase in benefits of improved

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environmental quality. To the left of C* the level of control would be too small. It can also be shown that at C* the sum of the residual damages plus the treatment costs will be minimized. Note that this reasoning usually implies that some residual pollution remains at C*.

This logic is widely accepted by economists, but has not been adopted as a matter of public policy. If the goals of public policy for water pollution control refuse to recognize that there is an optimum level of control involving comparisons of *MB* and *MC*, then we will make little progress. It will not be useful to argue the merits of market and private property approaches to pollution control versus collective and centralized decision-making unless there is a commitment to this logic.

How one applies the logic will probably continue to be controversial. How to estimate the *MB* and *MC* curves will remain a very difficult task for which there may never be precise answers. As we saw in the discussion of the four steps to estimate pollution damages, much of the information needed to compute *MB* curves is lacking. We know too little about dose-response functions. The presence of nonpoint sources of pollution makes the prediction of concentrations and the level of control costs difficult. The randomness and dynamic nature of the real world will cause the functions to shift. Finally, the distribution of benefits and costs of pollution control policy will always be a source of public debate. Nevertheless, the existence of a theory of the optimum level of pollution control is central to policy formation and implementation.

Efficiency Without Optimality

Ideally, then, pollution control measures should be pursued up to the point where the *MB* of control equals *MC* of control. But what do we suggest when we have little information on the shape and position of the *MB* function? Rather than do nothing or futilely ban all pollution, it has been proposed that achievement of predetermined ambient standards be used as the benefit function of environmental policy. For example, where the policy-maker is unable to develop an *MB* function for recreational fishing, the environmental agency might set a minimum standard of 5 milligrams per liter of dissolved oxygen to be maintained in a stream subjected to the discharge of BOD wastes. This standard would preserve fish life. In such cases Baumol and Oates (1975) have argued for the second-best approach of efficiency without optimality. The standard would be taken *provisionally* as given and the effi-

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ciency goal would be to minimize the cost of achieving that goal. Pollution control strategies would then be judged by their relative efficiency in achieving the standard.

There is much to be said for efficiency without optimality when the information required for an optimal solution does not exist. As we shall see below, the price system and market mechanisms can be employed to achieve environmental standards in a least-cost manner. Of course, once the minimum cost of achieving a standard is known, we will then be able to infer the minimum benefit the standard must have in order to justify its continuation. Acceptance of standards or environmental targets should not be used as an excuse not to implement step three and attempt to quantify damages in physical terms.

Alternative Pollution Control Strategies

We have argued that the goal of environmental policy should be to correct for market failure and improve efficiency in the allocation of environmental resources. We have suggested that the *MB* of control should be equated with the *MC* of control; short of that, the least-cost achievement of predetermined standards is the second-best goal. We have expressed concern that current environmental policy appears to have goals that are unrelated to either optimality or efficiency. In this section we shall analyze various pollution control strategies, with the primary basis for judgment their relative efficiency. The present policies for water pollution control not only have goals that pay little heed to efficiency, but also employ strategies or instruments that are not efficient. We will suggest that the market mechanism and property rights can play a greater role in policy for water pollution when efficiency in resource use is desired. The strategies, however, have limited applicability for curbing nonpoint pollution in an efficient manner, and implicitly assume that the pollution problem to be solved is one of control of point emissions.

Direct Regulation

The management strategy that is the backbone of current U.S. water policy is the use of the police power of the government to regulate either the output of residuals directly or to regulate the inputs used in production. Input regulation requires firms to adopt certain kinds of equipment or treatment processes, such as second-

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ary treatment of municipal wastes. Output standards tell a discharger how much emission is allowed at each source. Here the firm is allowed to determine the method for reducing emissions as long as the target is reached.

The economic literature is virtually unanimous in its criticism of the regulatory approach to water pollution control. The major criticism of direct regulation is that the information requirements to attain efficiency are not likely to be met. To determine the optimal input and output standards, the regulators would need to know the *MB* and *MC* functions of each discharger. If this information were known, regulation could be used to establish C^* for each of the dischargers and to set the optimal amount of ambient quality consistent with equality of marginal damages averted and marginal costs of control. With many dischargers and many receptors, going through the four steps to determine damages and then comparing incremental damages with a myriad of control cost functions is mind-boggling.

As actually practiced, the strategy of direct regulation is a more manageable task. First, some predetermined ambient quality standards are selected so that information on *MB* functions is not required. If efficiency without optimality were the second-best goal, the regulation strategy would attempt to set discharge regulations for each discharger so as to minimize the total cost of achieving the ambient quality target. Even in this second-best case, the information requirements for efficiency are formidable. It is not realistic to assume that regulators possess the necessary cost information on treatment of residuals for each of the dischargers under their jurisdiction in order to minimize control costs.

In the absence of such cost information, the regulators adopt shortcuts that often come out of tough bargaining sessions between regulators and dischargers. At issue is the cost and availability of control methods to be used in meeting discharge permits. In most cases, the bargaining process results in detailed and comprehensive regulation when the range of control techniques is large. However, the end result is usually some form of uniform cutback or uniform percentage abatement of emissions from previous levels. Regulators are under great pressures to treat different dischargers in the same region equitably. This means that "fairness" requires uniform percentage abatement.

Uniform percentage abatement is known to be wasteful; it fails to minimize total treatment costs. Since costs of pollution control vary greatly among sources, a policy of uniform percentage treatment is

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bound to be more costly than a policy which would equalize treatment costs at the margin among dischargers. Kneese and Bower (1968) found in a study of the Delaware estuary that a policy of uniform effluent charges would achieve given quality objectives at about half the cost of uniform percentage emission regulation.

Mills (1978) has also shown that under direct regulation, dischargers pay nothing for their quotas. The direct discharge policy prevents a discharger from discharging more than its quota (or treating a uniform percentage). If firms were subject to effluent charges on emissions, there would be no "free" quotas. They would have to either treat or pay a charge on *all* emissions. As a result, their costs of production would be higher and output less. By contrast, firms subject to direct regulation have lower costs, resulting in overproduction.

Buchanan and Tullock (1975) have shown that even with perfect information a system of direct regulation cannot be efficient because an incentive would remain for new firms to enter the industry. Without controls on entry and output the number of firms would grow, producing an inefficient output. The agency would also have to regulate where the firms may locate in a region in order to deal with interactions on ambient quality and on damages among emitters and receptors.

Kneese and Bower (1968) have also pointed out that direct regulation, in comparison with effluent charges, offers no incentive to the discharger to do more than meet standards. Charges have the advantage of placing continuous pressure on the discharger to improve his waste treatment processes. They also argue that effluent charges yield revenues so that the administration costs come more from the consumers and the firms involved than from general taxpayers. As we shall see below, this may generate political opposition from firms and agencies unwilling to bear the costs of effluent charges, particularly municipal discharges.

There are two instances where direct regulations can be defended. First, as Baumol and Oates (1975) have argued, effluent charges and tradable permits suffer from a serious liability as a means of pollution control because the number of permits or the effluent charge may be very difficult to change on short notice. During emergency periods when water levels are excessively low, emission levels suitable for normal periods may be inefficient or even intolerable. Some meteorological conditions are not easily foreseeable. For such "crisis" conditions, a temporary program of direct regulation of discharges may be justified.

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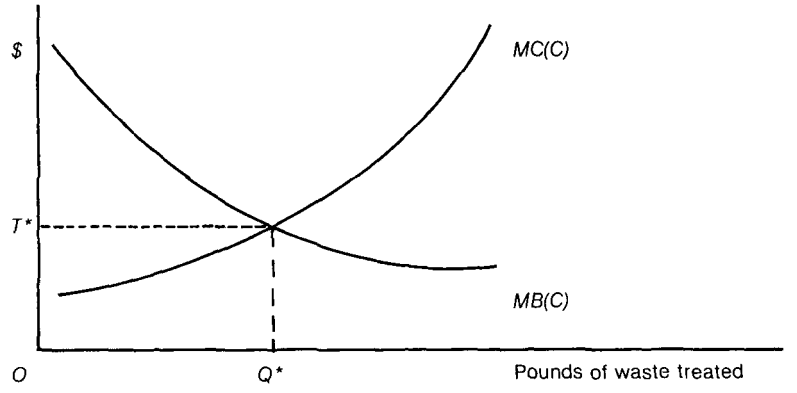
Second, Dorfman (1977) has argued that the correct effluent charge may be found only after some experimentation, and the risk of having dangerous concentrations of effluent may not be worth taking. In such cases direct regulation, despite the failure to minimize costs of treatment among dischargers, may avoid a more serious risk of dangerously high emission levels.

Effluent Charges

Most economists advocate effluent charges as the primary strategy for water pollution control. Stemming from the work of Pigou, taxes have long been advocated to correct for divergencies between marginal private costs and the marginal costs of pollution imposed upon third parties. In recent years, a strong case for effluent charges has been presented by Kneese and Bower (1968) and by Baumol and Oates (1975).

The difficulties of setting up an optimal set of effluent charges are essentially the same ones that face a regulator in establishing an optimal set of direct discharge regulations. In a world of perfect information the regulator would know the *MB* or marginal damage functions connected with each source of emissions. The regulator would also know the *MC* functions of all of the treatment options available to each discharger. The proper effluent charges on discharger A at location B would be T^* as shown in Figure 3 and the optimal amount of abatement would be Q^*. However, the regulator must

FIGURE 3
OPTIMAL EFFLUENT CHARGE



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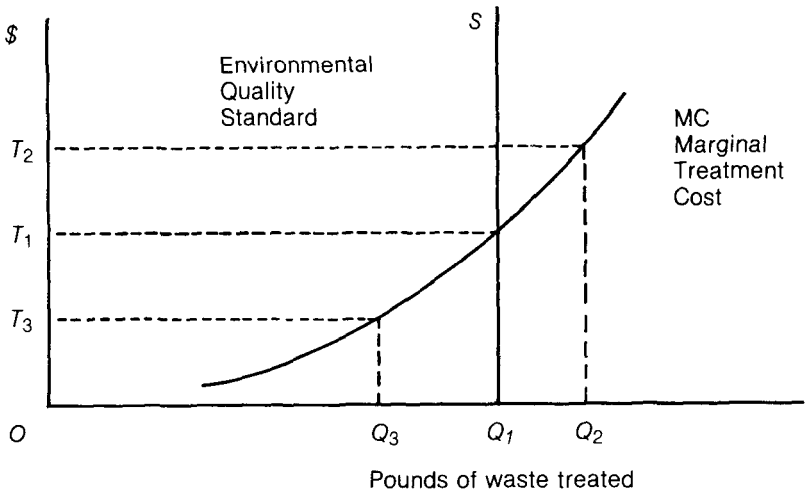
also have an accurate understanding of the effects of discharges at other locations and also the effects that effluent charges will have on other polluters. It is apparent that the degree of knowledge required to administer a system of optimal charges is completely unrealistic. As a consequence, *all* of the effluent charge schemes proposed are second-best approaches, which attempt to achieve some predetermined standards at the least cost, i.e., efficiency without optimality.

Figure 4 illustrates a "practical" scheme. The vertical *S* curve representing a predetermined environmental quality standard replaces the *MB* function from the preceding diagram. We assume that a discharge of Q_1 will meet some standard of environmental quality, e.g., dissolved oxygen of 5 milligrams per liter.

FIGURE 4
EFFLUENT CHARGES AND ENVIRONMENTAL QUALITY STANDARD



The correct effluent charge is T_1 which is equal to the marginal costs of treatment at the intersection with the environmental quality standard.

Assume, however, that the regulator does not know the position of the *MC* function and therefore has to guess at what level to set effluent charges in order to achieve the environmental quality standard. If the effluent charge is mistakenly set at T_2 because it is believed that treatment costs are higher than they turn out to be,

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the quality of waste treated will be Q_2 and the environmental standard will be exceeded. By contrast, if the effluent charge is set too low, say at T_3, because it is believed that marginal treatment costs are lower than they are, the level of treatment will be Q_3. Then environmental standards will not be achieved. It is hoped that through an iterative process, with changing effluent charges affecting the amount of treatment, we will converge at T_1 and Q_1.

It should be noted that the effluent charge approach achieves the least-cost combination for reaching the standard. As effluent charges are raised, a discharger will tend to cut back on emissions (treat waste) until the marginal cost of treatment is equal to the charge. Note, however, that all dischargers in the area are subject to the same tax. Therefore, the marginal cost of treatment will be equalized across all dischargers. This insures that total costs of treatment are minimized because any change in this pattern would involve either an increase in emissions or an increase in costs of treatment.

Effluent charges appear to be very attractive. They require relatively little knowledge about marginal costs of treatment for different kinds of firms and discharges. Also, they lead automatically to the least-cost pattern of achieving a given environmental standard. Compared with the drawbacks of direct regulation, these are major accomplishments.

There are, however, some problems with the effluent charge scheme. First, assume that the standard of environmental quality to be achieved is an important threshold. For example, assume that most fish will die if the level of DO falls below 5 milligrams per liter. If the tax is set too low, the environmental standard will not be achieved and the costs of being wrong may be very high.

Second, the system of iteration may impose substantial compliance costs upon dischargers. Often the investment costs in pollution abatement measures will be high. If the discharger perceives that the level of effluent charges is temporary, the firm will be reluctant to invest. This might lead to a destabilizing effect as opposed to a convergent process. If polluters are reluctant to invest in treatment because they think effluent charges will change greatly they may pay the charges and do little treatment. The control agency, in response, raises the charges. And instead of investing in treatment, the discharger might move from the region, even though the firm would have operated efficiently if the initial charge were close to the equilibrium rate.

Third, when firms enter or leave the region, the control agency

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will have to raise or lower the tax to reach the environmental standards. This may induce a new search process and create some instability. The agency is also perplexed about how much to raise or lower the effluent charge, so considerable instability can exist during periods of growth or decline in a region.

A fourth problem with the effluent charge strategy is how to set the "correct" zones or regions to which the charge will apply. In fairness, the problem of zonal definition is endemic to all strategies that depart from an individual policy for each point source of emissions. Ideally, of course, it would be desirable to have a separate schedule of effluent charges for each discharger. It is clear that the administrative burdens of such a system would be unreasonable. Therefore, the use of zones would allow common effluent charges and environmental standards to be specified within a given zone and different charges in other zones to secure the standard where costs of treatment differed. The problem of zonal definition arises where there is no natural clustering of dischargers. If dischargers in Zone A have an effluent charge of 10 cents per pound of BOD discharged and those in Zone B are charged 15 cents, it is clear that questions may arise as to where to draw the boundaries and how to treat firms located near boundaries equitably. Ackerman et al. (1974, p. 274) found this question of zonal definition to be a major problem in the case of the Delaware River Basin Commission. In order to reduce the pressures upon the commission, zonal differentials were made very small. Even so, the amount of "pushing and shoving" was considerable. However, a common environmental standard and effluent charge on point discharges all along a stream would reduce most of the efficiency gains that would come from relating discharge standards to ambient quality and to the use of the stream for different purposes in different sections. We will argue below that the pressures for uniformity of treatment across zones may be less intense under a system of tradable permits.

Finally, a system of effluent charges may run into political opposition from dischargers who rightly see that they either have to treat or pay "taxes" on all discharges. There will be no free rides, as with permits. Costs to firms will be higher than under direct controls (an advantage of the system) so it will be in the interests of dischargers to oppose effluent charges. In addition, special political pressures on the regulatory agency could come from municipalities that argue that they should be treated differently from firms because the effluent charge would put a financial burden on them. There is no analytical argument for giving cities special treatment.

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In fact, subsidies to cities would create incentives for industries to join municipal systems. Perhaps the lesson to remember is that in presenting logical solutions to problems one cannot neglect political factors.

A system of effluent charges implies that the property rights in the water system have been vested in the water users. This means that if the standards to be achieved are based upon the preservation of aquatic life, such activities as boating, swimming, and fishing, as well as aesthetic appreciation and the preservation of the ecology of the water resource, have a vested right. The regulatory agency or the state acts as an agent for such uses, and it sells rights to discharge waste depending upon the assimilative capacity of the water resource and the standard chosen. The effluent charge minimizes the cost of achieving the standard, with the revenues realized as a kind of economic rent earned by society from use of the assimilative capacity of the water. Kneese and Bower (1968) suggest that the revenues can be used to cover the costs of administration of the program and to finance large-scale regional facilities (taking advantage of economies of scale) to improve water quality and lower treatment costs for all. Baumol and Oates (1975, p. 196) show that the dischargers will suffer a welfare loss, even though the community gains, from the imposition of charges to correct externalities unless they share in the tax revenues. It would seem that political opposition to effluent charges could be reduced if provisions are made to share revenues.

It has often been pointed out that the logic of effluent charges can be reversed to justify the payment of subsidies to dischargers by the users of the environmental services (the public). In this case the property rights would be vested in the dischargers. The state would then act as the agent for the public and "buy" reductions in waste discharges to improve water quality. Theoretically, it can be shown that the subsidy and the effluent charge can achieve equivalent results on the equilibrium position of individual firms in terms of the reduction of emissions and minimizing costs of control. However, as Baumol and Oates (1975) have shown, the subsidy approach encourages the entry of firms (while the effluent charge approach encourages their exit) so that the industry output is greater, and this may offset reduction in emissions by individual firms from subsidies.

Krutilla and Fisher (1975) point out that the initial vesting of property rights in the public will change the distribution of wealth. And with such a change, preferences for environmental services over

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other goods and services may shift. As a result, the optimal amounts of environmental quality and waste disposal may change, which could affect the optimal effluent charge or subsidy. This is contrary to the position taken in Coase (1960). The outcome of the bargaining is not independent of the initial vesting of property rights.

Tradable Permits

In contrast to the large amount of economic literature on effluent charges, there is very little on tradable permits. Some of the important references are Dales (1968), Montgomery (1972), Ackerman et al. (1974), Roberts and Spence (1976), Ackerman (1977), Tietenberg (1980), Lewis (1981), and Halm and Noll (1981). The theoretical case for tradable permits is quite strong; they appear to offer substantial advantages over effluent charges. It remains to be seen, however, how applicable this strategy is.

Recently, EPA has developed three limited versions of the tradable permits concept, which are being applied experimentally to air pollution at various places in the country. They are:

1. *Bubbles:* Plants are allowed to reduce controls on air emissions in a portion of the facility where abatement costs are high, in exchange for an increase in control in the same plant where abatement costs are lower. Multiplant bubbles have recently been suggested.
2. *Offsets:* In a given air shed a firm may increase emissions if it pays for a reduction in emissions from some other source in the same region.
3. *Banks:* A discharger that exceeds its emission standard may get credit for some fraction of the excess reduction in emissions in an "emission bank." Credits could then be sold to other firms seeking emission permits. Rules for trades are now being worked out.

Although these new options do not yet have well-established procedures governing transactions, they do show a new concern by EPA to minimize the costs of attaining standards and also an appreciation of how market-like approaches can offer incentives to dischargers. Their long-term status is unclear. It also remains to be seen whether the permit transactions move closer to trades of property rights. We do not know if EPA is taking similar approaches to water pollution.

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Under the tradable permit system, the regulatory agency would determine the maximum total discharge of a pollutant to be emitted in a given region. Permits to discharge some fraction of this total would be printed and auctioned off or distributed in some fashion among dischargers. From then on, the allocation of emissions among dischargers would be determined by the market. Firms could buy permits in the original auction or purchase them from other firms or individuals. The government agency would have to monitor emissions to see that they were conforming with the discharge permits. Nothing would prevent individuals or groups who value clean water from buying permits and holding them idle.

The policy issues to be decided in the regulatory agency would be: (1) the environmental standard for ambient water quality; (2) the relation of total emissions to ambient quality; (3) the size of the region and whether to allow exchange of permits across zones; (4) the length of life of the permit; (5) how to issue the permits and then maintain a market for them; and (6) whether to change the ambient quality standards and number of permits as conditions warrant. Each of these policy issues involve a certain amount of "arbitrariness" and soul-searching. There are no obvious answers in a world of imperfect information.

It can be noted at the outset that the market here is not a true market in that the number of permits would be fixed in relation to some predetermined environmental target. Thus, the market only works on one side, that of rationing a fixed supply among a group of demanders. There is no feedback from the users about water quality achieved and their willingness to pay on the supply of rights, which is predetermined. A rise in the price of tradable permits signals only that permits are more in demand, but presumably it does not affect the amount supplied. This is clearly another case of efficiency without optimality. Each firm would buy or sell permits until the price of permits equaled the marginal costs of control. Since all firms would face the same permit price, marginal costs would be equated across the region and the total costs of abatement would be minimized. In a multiperiod situation the long-run marginal costs of control would be revealed by the equilibrium price of tradable permits.

The tradable permit scheme does not require knowledge of the marginal costs of treatment on the part of the agency nor does it require an iterative search for the correct effluent charge. Instead, the market makes the necessary calculations in the course of reaching an equilibrium price for permits. Thus, there is less chance of mak-

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ing an error on an important threshold. With effluent charges, the search for the correct charge may result in too little treatment and thus prove to be a costly mistake. Also, in the case of economic growth in the region, the regulatory agency does not have to guess how high to raise the effluent charge. New firms would have to buy up rights from existing firms, thus allocating pollution rights economically while still preserving environmental quality. Market adjustments in the price of pollution permits would be more flexible than administration of effluent charges in accommodating either growth or decline in a region. Currently all dischargers are required to have (nonmarketable) permits, so it may be easier to move to a system of tradable permits than establish a system of effluent charges.

Despite the advantages of a system of tradable permits, a number of difficult questions must be answered before we can be certain that efficiency can be achieved. Thus far we have assumed that there will be a large number of buyers and sellers of permits and that there will be a competitive long-run equilibrium price that will minimize abatement costs and yet distribute emissions among sources at various locations to meet certain ambient water quality standards. This is a tall order, which may be difficult to achieve in given watersheds. What are some of the implementation problems for a scheme of tradable permits? Will its application be restricted?

The basic questions go back to whether a competitive market can be constructed and how complex the technical relationships are between emissions (from point sources) and ambient quality. With regard to technical relationships, what pollutants and zonal definitions are to be used, and how do emissions interact to determine ambient quality? The effect of emissions on ambient quality is a function of location and geography, timing of discharges, the location of other emitters, and stochastic elements due to weather and other factors. It helps, of course, if the relationship between emissions and ambient quality is approximately linear. It also helps if emissions of key pollutants can be modeled as if they were independent or additive to other key pollutants. Over how large a region should the permit holder be allowed to locate? If the level of ambient water quality is very sensitive to the location of an emitter (not just to the amount of emissions), changes in the location of permits and emissions, with no change in total emissions, may produce significantly different levels of ambient quality. Clearly, a great deal of water quality modeling would be needed to simulate various locational patterns of emissions and the outcomes of different zonal

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boundaries and temporal patterns. We do not want to make too much of these technical problems because most of them exist under any kind of pollution control scheme. Nevertheless, the significance of possible changes in the spatial distribution of emissions needs to be carefully worked before emission permits can be made fully tradable for a given zone or geographical area.

On the economic side, the requirements are that the market be reasonably competitive. If it is not, it is possible that the efficiency losses from monopoly power either in the sale or purchase of permits will erode much of the efficiency gains of the system. It is also possible that a "thin" market may not generate prices for permits that are sufficiently close to the long-run equilibrium price to encourage either the proper amount of investment in permanent pollution control facilities or the proper number of firms in the area. In theory, a competitive regime of property rights in pollution permits can be shown to have the desirable equilibrium properties. The possibilities of noncompetitive markets and their properties need to be examined before one can fully endorse a scheme of tradable permits. Notice that the zonal definitions in terms of maintaining ambient quality standards may have to be qualified in terms of the requirements of a competitive market. The size and configuration of emission permit regions also will affect the number and size of potential market participants and the equilibrium solution.

With regard to equity, a primary question is the initial distribution of permits. At one extreme is the assumption that the property rights belong to the state and that the best solution is to simply auction off the permits to the highest bidders and let the process begin. This would mean that emitters would pay economic "rent" for permits plus abatement costs. An alternative would be to base the distribution of permits on the pattern of emissions that existed in preregulatory days. Another version of this policy is to make all existing discharge permits tradable. If the relative amount of the emissions were approximately equal across sources and if the number of emitters were large, the chances of achieving prices in the short run that would be close to long-run equilibrium prices would be good. Therefore, rational, long-term investment planning and cost minimizing would be fairly assured. However, if there were one or two large sources of emissions and a group of small emitters, there might be a problem in getting the market started fast enough to give the right signals to firms making location and abatement investment decisions.

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Halm and Noll (1981), in investigating a potential market for tradable permits in sulfur oxide emissions in the Los Angeles airshed, identified 30 emitters of consequence. However, one firm had approximately 30 percent of all emissions. The problem they were concerned with was how to organize a permit market with a single large source and yet to try to approximate a competitive outcome. One outcome they investigated was to allocate only a fraction of the permits on a historical basis, say 80 percent, and then let the agency auction off the remainder. Thus, it would be possible under some schemes of permit distribution to place all firms in the position of being buyers, which would nullify some of the market power of the largest firm. Such a scheme would help preserve some equity by giving existing emitters some automatic property rights. This policy might go part way in appeasing municipal dischargers, who might demand special treatment if the auction method were used to vest all initial permits.

Ackerman et al. (1974, p. 275) feel that the tendency to minimize effluent charges across zones by regulatory authorities would be lessened with tradable permits. With a fixed number of rights in each zone, firms located on zonal boundaries could participate in both markets. When it is economical, such firms could buy a permit in an adjacent zone and pipe their wastes to the next zone. The calculation of the "correct" price is done by the market, and the option to pipe wastes to a neighboring zone reduces pressures for plant relocation.

Implementation problems include the length of life of the permit and how to change the number of permits as pollution policies change. The regulatory agency must be careful not to generate uncertain expectations regarding the decision to invest in permits and long-lived capital facilities. When information is imperfect, particularly when first starting a tradable permit scheme, it might be wise to issue permits with varying maturities as Ackerman et al. (1974, p. 268) have suggested. The arguments for moving toward a permanent vesting of rights are very strong. As the benefits of achieving predetermined environmental targets are better understood, the question of whether to change the number of permits can be faced with more information. Most of the monitoring and enforcement problems appear tractable compared with alternative strategies.

Obstacles to Efficient Policy

There are a number of obstacles to the establishment of an effec-

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tive and efficient water pollution abatement policy. Perhaps foremost is the basic indifference about efficiency in a clean-water program. Unless there is some kind of headline-catching scandal, the fact that billions of dollars are being spent for pollution control facilities without documentation of possible benefits will continue to elicit little public outcry. In addition, there is a widespread notion that water pollution is simply wrong and that it is the role of government to exercise its police power to eliminate all pollution rather than to weigh the benefits and costs of alternative abatement policies. How else can we explain the fact that basic economic analysis has played almost no part in the formulation of water pollution policy? There has been an almost exclusive reliance on detailed federal regulation and judicial enforcement despite repeated criticisms of the inability of the bureaucracy to cope with complex environmental problems. The excellent, well-written critique by Kneese and Schultze (1975) of air and water pollution policies has received little attention by the Congress and the electorate.

Lack of Benefit Estimation

A second major barrier to the achievement of efficiency may stem from the first, but it needs special emphasis. In the discussion of the four steps to measure pollution damages, it was pointed out that measures of damages should be viewed as the benefits from abatement. Without measuring benefits, efficiency cannot be ascertained. Although measures of damages, particularly step four involving dollar valuations, cannot be done easily, we have to go as far as we can. Benefit-cost analysis should not be considered a simple decision rule, but a way to systematically organize information to help make choices about pollution damages and the resources involved in pollution control.

The theory of what and how to measure benefits of water pollution abatement is well understood (Freeman 1979). Currently, we do not have good approximations of the damages caused by pollution in various river basins and major lakes. Empirical estimates of the benefits of water pollution control policy are badly needed. As Freeman suggested (p. 265): "It would be penny-wise and pound-foolish not to plan to allocate 1 or 2 percent of the total funds to be spent on pollution control toward measuring and evaluating what we have bought with that massive expenditure."

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Nonpoint Pollution

Nonpoint pollution is perhaps the major challenge facing the cleanup of the nation's water supplies. As earlier pointed out, more than half of all pollutants entering surface waters come from nonpoint sources. It is believed that nonpoint pollution also seriously affects ground water, although systematic data on ground water quality is not available. In contrast to the limited progress that has been made in cleaning up point discharges, progress with nonpoint sources is almost negligible. The most important nonpoint sources of pollution are agriculture, urban runoff, forestry and mining, and individual wastewater disposal (septic) systems.

Agriculture

According to CEQ (1979, 1980) water pollution from agriculture affects 68 percent of all river basins in the United States, with most of the pollution the result of fertilizers, pesticides, pathogens, organic materials, and sediment. Half of the sediment entering surface waters stems from soil erosion from farming, about 3.8 billion tons annually. According to the GAO (1977), soil erosion into streams is 25 percent worse than in 1934 despite conservation efforts. It is believed that 7.5 million tons of phosphorus and 600,000 tons of nitrogen enter surface waters annually. Most agricultural runoff is difficult to manage and can seriously upset ecological balances.

Urban Stormwater

Pollution from urban runoff, a more serious problem than previously recognized, contains heavy metals (lead, zinc, and copper) as well as high concentrations of coliform bacteria, BOD, asbestos, suspended solids, and oil and grease. CEQ (1980) reports that a study of Washington, D.C., found that street runoff contained 104 times as much suspended solids as the effluent from a secondary treatment sewage plant. The lead concentration was 1,015 times greater. Most of the older cities in the U.S. have combined sewer and stormwater collection systems that are a major source of water pollution. The amount of raw sewage and wastes dumped into receiving surface waters during rainstorms may offset sewage treatment in dry weather. Chicago's problems with raw sewage backing up into residences, flooding streets, and pouring into surface waters are well known. The city's tunnel and reservoir plan (TARP) to deal with this problem may turn into one of the most ex-

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pensive public works projects ever, $11 billion at last estimate. The GAO has recommended that EPA reconsider TARP.

Other Nonpoint Pollution Sources

Septic systems are causing water quality problems in 43 percent of the U.S. river basins. Coal mining leads to sulfuric acid pollution in nearby surface and ground water. Forestry can cause soil erosion and landslides. Runoff from municipal and industrial waste disposal sites is now believed to pollute drinking water sources. One of the chemicals most frequently found in treated as well as untreated drinking water is trichloroethylene (TCE), a widely used solvent and degreaser, which causes cancer in mice.

The dangers of nonpoint toxic runoff has come to light only in the past five years. Yet the seriousness of organic waste pollution has been long established. For example, EPA estimates of total suspended solids and organic waste discharges for the U.S. for 1973 are shown in Table 1. The striking fact about Table 1 is how much the TSS wastes (96 percent) and BOD wastes (82 percent) are dominated by nonpoint sources. Yet EPA for years has granted permits for point discharges of such wastes and supervised a very expensive cleanup process. Of course, national totals can be deceiving. For one thing, nonpoint discharges may be more diffused than point emissions. But from 1975 to 1979 there was little improvement in dissolved oxygen in many surface waters despite the large expenditures and heavy regulation to reduce BOD pollution. If nonpoint sources of pollution are a relatively large part of the problem, how can we expect water pollution control policy aimed at point sources to be effective and efficient?

TABLE 1

EPA ESTIMATES OF U.S. DISCHARGES OF TOTAL SUSPENDED SOLIDS AND ORGANIC WASTE, 1973
(billion pounds)

	TSS		BOD	
Municipal sources	5.9	(0.15%)	5.6	(10.2%)
Industrial sources	117.9	(3.10%)	4.3	(7.8%)
Nonpoint sources	3,698.0	(96.75%)	45.0	(82.0%)
Total	3,821.8		54.9	

SOURCE: Council on Environmental Quality, Seventh Annual Report, 1976, p. 257.

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To be fair, the Clean Water Act of 1977 gives EPA no specific authority to regulate pollution from nonpoint sources. EPA is awkwardly trying to deal with nonpoint problems through a Water Quality Management Program known as the "208" plans. The 1972 legislation was largely silent on nonpoint problems. Under 208 plans, states or regional planning agencies must propose "solutions" to regional water quality problems from point and nonpoint sources for both surface and ground waters. This is a tall order. Plus, the plans are not binding on anyone and have been widely criticized for their lack of specificity. The fact is, there are very few obvious solutions for the control of nonpoint runoff. Everyone talks about the need for "comprehensive" and "rational integrated solutions to complex regional water quality problems," but there needs to be more than comprehensive plans and vague references to land management techniques (known as BMPs, or Best Management Practice, in EPA jargon).

Under remedies for nonpoint pollution, CEQ (1980, p. 135) lists only two BMPs — "practices such as soil tilling that minimizes soil erosion in rural areas and street sweeping that minimizes total suspended solids in urban runoff." Funds are being spent by EPA under a Nationwide Urban Runoff Program and a Rural Clean Water Program (with the U.S. Department of Agriculture) to come up with nonpoint solutions. Thus far, the results are far from encouraging.

Economists writing on water pollution have not been able to offer much help either. Direct regulation of sources by licenses, effluent charges, and tradable permits are relatively well examined in the literature, but these techniques apply to point pollution. The common law concept of liability for damages for nonpoint pollution is difficult, if not impossible, to apply when hundreds of nonpoint polluters and parties sustaining uncertain damages are involved. The fact is that the policies applicable to point source pollution appear to have little value for nonpoint pollution problems. It also appears that most economic theorists are unaware of the magnitude of the nonpoint problem.

Kneese and Bower (1968) and Davis (1968) have made a case for regional river basin management of water quality. They believe that such agencies could influence land use decisions to reduce nonpoint pollution. They also advocate instream treatment measures, as opposed to exclusive emphasis on end-of-the-pipe treatment, which may be effective for nonpoint problems. Short of such broad-brush suggestions, we are lift to particularized measures for slowing

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runoff, such as settling ponds for urban stormwaters or putting up barriers to inflows, like swales around urban lakes or dikes on irrigation drainage canals. It is possible that such practices may have payoffs that are higher than expensive treatment facilities for point emissions. We will never know, however, until we begin to weigh benefits and costs of all of the various abatement alternatives.

Conclusion

This paper examined various pollution abatement strategies as a basis for an efficient water pollution control policy. Particular attention was paid to the present policy of direct regulation and to two untried market approaches, effluent charges and tradable permits. There is a need for an efficient water policy based upon a weighing of benefits and costs. But the question is whether an efficient water pollution policy can really be achieved.

The evidence is fairly clear that the present policy of detailed direct regulation of discharges is expensive, wasteful, and ineffective. Economic concepts have not been employed in the goals being sought or in the instruments being used. No credible estimates of benefits and costs of current programs exist despite the expenditures of billions of dollars. Much more worrisome is that even though these conditions are relatively well known by economists, there is little public concern for efficiency and little effort to change the thrust of water pollution policy by the electorate or by Congress.

Other obstacles to efficient policy are noted. One is the failure to estimate physical damages from pollution in a systematic fashion and the failure to at least attempt to place monetary values on damages averted by pollution abatement. This means that benefits of environmental improvement from water quality are in the realm of conjecture.

Another obstacle stems from the failure to deal with the serious problem of nonpoint pollution. Efforts to deal with water pollution by controlling only point sources cannot succeed. Current U.S. policy as well as the economic literature fail to recognize this problem.

With regard to point pollution, both effluent charges and tradable permits have significant advantages over direct regulation. The use of administered markets can do much to reduce regulatory controls and to allow for more initiative by individual decision-makers to achieve least-cost solutions. In addition, the integration of water

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law with these market-type solutions promises to strengthen the role of private property and market allocation. The need for public policy in water pollution has arisen because private markets are not working well. Instead of attempting to make markets and the price system work more effectively, Congress has adopted a policy of direct regulation. Effective and efficient water pollution control policy requires a commitment to make greater use of markets and the price system as instruments of social policy. Even more basic, however, is a commitment to a goal of efficiency in environmental policy itself. The obstacles to such a commitment appear formidable.

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WHO CARES ABOUT EFFICIENCY?

Terry L. Anderson

The answer to the question in the title of Professor Milliman's paper is yes, water pollution policy *could* and *should* be efficient. But this misses the crucial question: Can we reasonably expect that water pollution policy will be efficient?

After briefly addressing Professor Milliman's major points, I would like to consider the likelihood of achieving efficient policy. I then will discuss the institutional constraints that lead to my conclusion.

Milliman's theme is an old one in natural resource economics. Students in any undergraduate resource economics class are made keenly aware of the fact that there is an optimal level of pollution. Furthermore, they understand that from the menu of policy alternatives available for achieving this optimal level, some policies have lower costs (are more efficient) than others. Milliman, however, asks why the efficiency principles have not had more of an impact on pollution policy. This is the second paper I have seen recently that asks why policy-makers have not responded to the economic sermon and searched out the efficient marginal conditions. What I find hard to believe is that economists would ever expect policy-makers to have efficiency as their goal. After all, government officials are utility maximizers who have no proprietary interests in pursuing environmental efficiency for the "public interest." Instead, they will be subject to intense special interest pressures that will cause them to diverge from the pursuit of socially efficient pollution control.

It is well known that government officials increase their utility by expanding their sphere of influence. Hence, it is no mystery why bureaucrats have favored direct pollution control over market alter-

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natives. As Professor Milliman points out, direct regulation requires considerably more information and hence a larger bureaucracy. The extent of discretionary power inherent in pollution regulation has been aptly summarized by Steven Williams:

> At every stage of the [regulation] procedure, we see government agencies exercising enormous discretion: the EPA sets standards for new plants in every subcategory of every industry; state agencies set standards for all plants to make them conform to the SIP [state implementation plans]; and state agencies decide whether or not to issue the necessary permits for a new plant in nonattainment or PSD [preservation of significant deterioration] areas. This vast discretion has three dangerous facets: it is an occasion for influence-peddling, it breeds unfairness, and it erodes the rule of law.[1]

Even in the cases where the politician or bureaucrat is in the business of establishing and enforcing private property rights, it is likely that inefficiency will result. For example, when private property rights are assigned in ways that encourage rent dissipation, privatizing the commons may not improve resource usage.[2] In the extreme case, "rent seekers" could dissipate the entire gain from privatization. Whether this will happen depends upon the incentives of those who are designing and implementing the property rights system. When the definition and enforcement of rights is in the hands of the utility-maximizing bureaucrat, the issue will be whether the bureaucrat gains from the process. The Milliman paper suggests that a simple auction be used to facilitate the initial assignment of pollution permits. This, of course, would eliminate rent-seeking initially. But if the proceeds from such an auction do not remain in the discretionary domain of the bureaucratic agency, it is unlikely that this form of allocation will be chosen. The result is that utility-maximizing bureaucrats opt for actions by potential claimants that will generate utility for the bureaucrats.

Finally we turn to the question of whether there is any way of structuring political institutions to encourage efficiency. My suggestions, though by no means novel, should be contrasted with

[1] Steven F. Williams, "Pollution Control: Taxes Versus Regulation," Original paper 23, International Institute for Economic Research, August 1979, pp. 9-10. For more detailed discussion of this type of rent seeking, see Mike Maloney and Bruce Yandle, "Building Markets for Tradeable Water Pollution Rights," forthcoming in Terry L. Anderson, ed., *Water Use in the West: Scarce Resource Allocation, Property Rights and the Environment* (Cambridge, Mass.: Ballinger Publishing Co.).

[2] Terry L. Anderson and Peter J. Hill, "Establishing Property Rights in Energy: Efficient vs. Inefficient Processes," *Cato Journal* 1 (Spring 1981): 87-105.

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those of Professor Milliman and other economists who have tried to convince politicians that efficiency should be their goal. Convincing people that they should take actions not in their self-interest is fruitless; rather, institutional constraints that link self-interest with efficiency or which preclude inefficiency must be considered.

My first suggestion is that more attention be paid to constitutional constraints on political action. It is possible that at this higher level rules can be devised that promote economic efficiency. The first 50 years of the republic suggest that it is possible to discourage rent seeking by depriving government of economic empowerments.[3]

The second possibility for increasing the likelihood of efficient policy is to have policy formulated in a less centralized governmental arena where costs and benefits fall more directly on constituents. At this point the efficiency of common law comes to mind. Furthermore, evidence suggests that efficient solutions are more likely when there is competition among governments.[4] As long as the decision-making unit faces some of the costs of promoting inefficiency, there is greater hope for efficient policy. While this decentralization may not be possible for all water pollution control programs, it at least suggests that policy formulated closer to those who stand to gain and lose will be scrutinized more carefully for efficiency.

Lastly, the work of Adam Smith makes it clear that efficiency will only be generated by institutions that guide self-interested individuals in the direction of what is socially beneficial. His "invisible hand" is really a system of private property rights that links authority and responsibility. An attempt to educate molders of public opinion on this doctrine may help promote economic freedom and efficiency.

[3] For a more detailed discussion of the role of the Constitution, see Terry L. Anderson and Peter J. Hill, *The Birth of a Transfer Society* (Stanford, Calif.: Hoover Institution Press, 1980).

[4] See Terry L. Anderson and Peter J. Hill, "An American Experiment in Anarcho-Capitalism: The *Not* So Wild Wild West," *Journal of Libertarian Studies* 3 (Spring 1979): 9-29.

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ETHICS AND THE MARKETPLACE

P.J. Hill

Professor Milliman's paper is a thoughtful discussion of the past problems in and the future prospects for achieving allocative efficiency in water pollution policy. He presents a cogent argument for extending the use of private property and the market where possible and where not feasible, replicating its results with pollution charges and/or tradable permits. However, one of the more disturbing aspects of the paper is his recognition that there is little public interest in doing so. This is the basic issue I wish to discuss.

There is a general antipathy to prices, markets, and private property on the part of policymakers and the public. Moral and ethical considerations weigh heavily, and if people are not convinced of the morality of markets, efficiency considerations will seem of little importance in determining policy. Below I list some of the common ethical objections to private property and markets and my response, using where possible the context of the water pollution issues raised by Professor Milliman.

Objection 1

The market, through its emphasis on competition, promotes greed and strife.

Response

This view of markets is surely incorrect, though it is a widely held belief. As long as scarcity exists — when there is just not enough to go around to satisfy all existing desires — competition will exist. The market system is not the cause of people acting in their own self-interest; it is simply an attempt to channel that self-interest in socially productive ways. The institution of private property in-

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sures that when people impose costs on others or generate benefits for others, they must take cognizance of those costs and benefits. In fact, the attempt to apply property rights to the solution of pollution problems is precisely that, an attempt to keep people from imposing costs on others without their consent.

A market that is built around a system of well-defined and enforced property rights encourages social coordination. Such a market pinpoints potential areas of cooperation among individuals. It encourages individuals to look for ways of satisfying other people. Transferable property rights means resource owners will be rewarded only if they satisfy consumers' preferences.

In contrast to the cooperation that is encouraged by the market system, alternative institutions are much more likely to promote confrontation and strife. In the case of water pollution, nonmarket-oriented policies result in either/or solutions: Either the polluter wins the right to continue imposing costs upon other people without their consent or the recipient wins the right to have the pollution reduced with no attention to marginal benefits and costs.

Objection 2

The market system only acknowledges present desires. It doesn't allow future generations, who might have a high demand for clean water, to buy in.

Response

Again, this view of markets is almost completely divorced from the way they actually work. Private property rights allow people ("speculators") who believe that future generations will want to preserve a resource to withhold that resource from present consumption and, if they are correct, to be rewarded for their actions. Hence, those wishing to consume it now must bid it away from *all* of the potential claimants who believe it will be more valuable in the future. Since there is a wide diversity of opinions about the future value of resources, present users must be willing to out-bid even the most optimistic of those that are speculating on future value. While it may be true that under any set of institutions, the present generation will, out of altruism, consider the desires of future generations, it is surely the case that if people are rewarded for their efforts to preserve, they will do so more often.

Objection 3

The institution of private property leads to an unequal distribu-

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tion of wealth and power. In the context of water pollution, if a pollution tax or tradable permits are instituted, the wealthy will find it easiest to acquire the right to pollute.

Response

History speaks eloquently on this issue. By far the most effective defense against some people having undue power over others has been the institution of private property. Political power is always somewhat concentrated, even in a democracy. One man-one vote, while pleasing rhetoric, does not explain the mechanics and incentive structure of most collective decision-making. When more and more of the decisions about the use of resources are carried out through the coercive power of the state, those who have political clout find they also have substantial economic clout. Even though power is not equally distributed in the marketplace, it seems to be even more unevenly distributed in the political arena. The fear that market solutions to the pollution problem would lead to greater concentrations of power in the hands of a few individuals seems to be largely unfounded. It is when decisions about the use of resources are politicized that certain individuals gain undue power over others.

It is a fallacy that pollution charges or tradable permits would allow the wealthy to pollute unduly. The purpose of such policies is to force people to bear the costs of their actions. Therefore, if the charges or permits are appropriately instituted, the willingness of some to continue polluting simply means that resources are moving to their highest valued use. A tax on pollution is not a license to pollute, it is simply an attempt to approximate the market by giving the right to use resources to people only if they have paid for them. Again, it is important to remember that a system of property rights means that individuals can only take actions that impact upon other individuals if they take into account the consequences of those actions.

Objection 4

Markets maximize the wrong goals; they give us not what we really need but instead only what we are willing to pay for. This is well illustrated by a recent comment by Senator George Mitchell (D-Maine), who in commenting on some changes in the Clean Air Act said, "If economics are taken into account at standard setting, then ambient standards no longer set acceptable levels but instead levels that we can afford."

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Response

A system of property rights and the consequent market that develops from those rights will not necessarily yield results that are congruent with some predetermined set of "socially appropriate goals." These institutions are simply allowing people to express their preferences about the goals that they feel are important, rather than allowing the ends towards which they strive to be determined by others in the society. What the critics of markets are often saying is that people have the wrong goals, and that they would be most happy to have the coercive power of the state at their disposal to see that the correct ones are met. It is true, as Senator Mitchell fears, that a market order will only provide those things that people are willing to pay for. However, this would seem to be an advantage rather than a disadvantage.

Markets also allow a much greater diversity in goals than alternative systems. People who feel strongly about issues, but are not in a majority, are much more likely to find their desires met under a private property, market system than under an order of collective decision-making. The all-or-nothing aspects of collective decision-making mean that people who fail to convince the majority that they are correct end up dissatisfied. In contrast, in markets you only have to convince another property owner to exchange with you. Markets also allow people who feel very strongly about some things to represent those feelings in an efficient and low-transaction-cost manner. If some individuals feel, for instance, that the majority of the population is making wrong decisions about the allocation of resources over time, they can bet against the system; they have a way of expressing their differing viewpoints. In a world of uncertainty it would seem desirable to have a system that allows and encourages diversity.

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POLLUTION EXTERNALITIES: SOCIAL COST AND STRICT LIABILITY

Peter Lewin

Introduction

This paper critically considers the neoclassical social-cost approach to problems of pollution. This traditional approach, when subjected to close scrutiny, is found to be seriously wanting in applicability and consistency. A less ambitious alternative based on notions of strict liability is offered.

The social-cost approach is an offshoot of the "new welfare economics" developed during the last four decades. In its modern manifestation it entails the use of notions of economic efficiency to determine basic rights, including the right to pollute. This efficiency approach is surveyed in the next section. In the final section I will offer the strict liability alternative as a preferred approach.

The methodological basis of the criticism of social cost comes from a revived and growing tradition in economics known as subjectivism. I contend that most economists would agree that the subjectivist approach is the correct one, but they are unwilling to live with its implications. For that reason the implications are seldom drawn. This inconsistent behavior may be responsible for much ill-conceived policy. It is my purpose in this paper to foster an awareness of these problems in the hope of promoting more careful policy responses.

The Efficiency Approach

Pollution as an Externality

In by far the majority of cases, modern economists writing about

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pollution do so within a theoretical framework that sees pollution as a result of some sort of "market failure." If property rights of ownership and exchange of resources were always well defined, and as a consequence, the exchange process did not generate any "externalities,"[1] market failure could not exist. Thus, if a factory located next to a laundry spews smoke into the air, thereby increasing the laundry's production costs, this is because the "market fails" to charge the factory for its use of the air as a dumping ground. Similarly, if two firms are located on a river, one upstream, one downstream, and the former discharges waste into the river that impacts adversely on the latter, this is only an externality problem if no one owns the river and can regulate and charge for its use.

In the absence of market failure in a fully competitive, stationary economy (one devoid of monopoly elements and distorting taxes), relative prices will reflect accurately the (private) costs as seen by the individual economic agents. Such a situation will be a Pareto optimum, that is, a situation characterized by the property that any change will make at least one agent worse off. In the presence of externalities the marginal costs as seen by the private agents — marginal private cost — may diverge from the marginal costs to "society" — marginal social cost. Thus, the polluting factory mentioned above does not reckon as part of its incremental cost of production the cost to "society" of the additional deterioration of the atmosphere that it causes. Its marginal private cost is below the marginal social cost. Such a situation will not be Pareto optimal.

Economists often suggest that a judicious combination of taxes and subsidies (ignoring administration costs) can move the society to a new situation in which both a polluting factory and society are better off; the factory, because it is paid not to pollute (or pollute less), society because it has cleaner air. If so, the new situation is Pareto superior. A potentially Pareto superior position exists if the value of cleaner air to society is greater than the value of lost production to the factory. Thus, a policy to reduce pollution may be a move to a potentially Pareto superior position (sometimes identified as a Kaldor-Hicks move) even if no compensation is actually paid to the factory. Obviously, these concepts apply not just to our factory example, but to all pollution externalities.

Naturally, the question arises: If a potential Pareto improvement exists, why do the affected parties not negotiate a mutually beneficial deal voluntarily? The amount that smoke pollution vic-

[1] An externality is an effect "external" to the transacting parties.

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tims are willing to pay to reduce (eliminate) the pollution is, by definition, sufficient to bribe the factory to go along. The short and obvious answer (to which I will return later) is that the costs of transacting such a deal are prohibitive, particularly if there are a large number of pollution victims or if the negotiating parties engage in strategic behavior.[2] If there are a large number of pollution victims, pollution acquires the characteristics of a public good (or, more accurately, a public "bad"). Public goods are those goods like radio, television, national defense, and widespread pollution from whose benefits or harms it is difficult (impossible) to exclude additional consumers. More intuitively, pollution removal may be something which automatically (i.e., at no extra cost) benefits all the pollution victims so that the familiar "free rider" problem emerges.

From the perspective of this theoretical framework then, pollution is equivalently a problem of a divergence between private and social costs, an inability or reluctance to adequately define and enforce property rights, or a problem of the existence of (sometimes public goods-type) externalities. And the general solution is somehow to "internalize" the externality (for example, by establishing and enforcing new property rights or by tax-subsidy policies to achieve equality between private and social costs, etc.). Such policies will involve potential Pareto improvements. A move involving a potential Pareto improvement is sometimes called an "efficient" move.

Alternative Solutions

The efficiency approach to pollution outlined in the previous section seems to provide, in spite of its formidable terminology of externalities, market failure, Pareto optima, public goods, etc., a coherent and consistent framework for analyzing pollution problems. Its attractiveness lies in its apparent ability to "solve" the pollution problem by identifying the "optimal level" of pollution[3] and adopting the most attractive policy to achieve it. The economics literature, nevertheless, evidences considerable debate as to which policy would best achieve the desired result.

[2] See, for example, A. Mitchell Polinsky, "Controlling Externalities and Protecting Entitlements: Property Rights, Liability Rule, and Tax-Subsidy Approaches," *Journal of Legal Studies* 8 (January 1979): 1-48, for a rigorous treatment of the questions of strategic behavior in this context.

[3] For a prototype, see Wildred Beckerman, *Pricing for Pollution* (London: The Institute of Economic Affairs, 1975).

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It was in his influential *The Economics of Welfare* that Arthur Pigou[4] made popular the notion of a divergence between marginal social cost (MSC) and marginal private cost (MPC). A simple solution to this divergence would appear to be to impose an excise tax on the polluter equal to the divergence MSC-MPC. This would internalize the cost to the polluter whose marginal cost including the tax would be MPC + (MSC - MPC) = MSC. An alternative would be to subsidize the polluter not to pollute. If we ignore the implications of wealth effects and entry into the polluting industry in the long term, this should produce a result identical to that obtained with the excise tax. This is because for every increase in output that the polluter produces, he forgoes a subsidy equal to the increase in the value placed on the damage to the environment that he causes. However, the tax alternative is often preferred for two reasons. First, since it is the polluter who "causes" the damage, equity considerations entail that he should pay. Second, the subsidy alternative will encourage more polluting firms in the long run.[5]

The tax on pollution of the air and water (effluent charges) is seen to have a number of advantages over more direct systems of regulation. A system of direct regulation of pollution would have to choose among controlling the output of the polluting industry, the level of pollution it causes, the pollution avoidance measures it adopts, or the pollution avoidance methods adopted by the victims. As with all systems of direct quantitative controls, the danger of bureaucratic inefficiency looms large. The strong incentive to collect and use information relating to pollution in an efficient way is lacking. By contrast, using a tax preserves many of the features of a spontaneously adjusting price system. It reduces the range of decisions to be made by a pollution administration bureaucracy to the choice of tax rates, methods of collection, disbursement, etc., and it preserves the incentive of the firm to search for innovative, less expensive methods of pollution control.[6]

> Effluent charges always possess a further major attraction; their enforcement mechanism is relatively automatic. Unlike direct controls, they do not suffer from the uncertainties of detection, of the decision to prosecute, or of the outcome of that judicial hearing including the possibility of penalties that are ludicrously lenient.[7]

[4] A.C. Pigou, *The Economics of Welfare,* 4th ed. (London: Macmillan and Co., 1946).
[5] For example, Beckerman, *Pricing,* pp. 38-39.
[6] See generally Beckerman, *Pricing;* Allen V. Kneese, *Economics and the Environment* (Middlesex: Penguin Books, 1977), chaps. 1 and 5; and Stephen F. Williams, *Pollution Control: Taxes Versus Regulation,* ITER original paper, August 1979.

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However, introducing complications into the analysis may cause one to modify the presumption in favor of taxes somewhat. In spite of their well-known disadvantages, direct controls may be preferred on the grounds that *if they can be enforced* (at reasonable cost) "they can induce with little uncertainty, the prescribed alterations in polluting activities."[8] The facts of uncertainty may, furthermore, entail some sort of hybrid program, particularly when some threshold level of pollution damage is to be avoided at all costs.

> Where threshold problems constitute a serious environmental threat and where levels of polluting activities may require substantial alteration on short notice, which is not a rare set of circumstances, a hybrid program using both fees and controls may be preferable to a pure tax subsidy program.[9]

The reference to changing conditions in the above quotation should give us pause. The efficiency framework of analysis, which lies in the background of the discussion of the optimal regulatory policy, is at its best in an unchanging, static environment. As long as the changes we admit into the analysis are easily predictable in a relative frequency sense (like the weather as an influence on pollution effects), we may preserve some of the neat properties of the framework and proceed (as do Oates and Baumol and others) to weigh advantages and disadvantages of alternative regulatory schemes in a fairly definitive way. But when the environment is a radically dynamic one, in the sense that intrinsically unforeseeable changes occur often, we may wonder whether an alternative approach is not called for. I will return to this at some length.

A major challenge from within the efficiency approach to the use of any regulatory device as a solution is provided by the property rights approach to resource usage. It is best to consider this first before attempting a more general critique. Early contributions by Frank Knight and Jacob Viner[10] served to weaken arguments in favor of administrative intervention and to strengthen the presump-

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[7] Wallace E. Oates and William J. Baumol, "The Instruments for Environmental Policy" in Edwin S. Mills, ed., *Economic Analysis of Environmental Problems* (New York: National Bureau of Economic Research, 1975), p. 103. See also the highly readable Edwin G. Dolan, *Tanstaafl* (New York: Holt, Rinehart and Winston, 1969), chaps. 3 and 4.

[8] Oates and Baumol, "The Instruments," p. 106.

[9] Ibid., p. 108. See also E.J. Mishan, "What is the Optimal Level of Pollution?," *Journal of Political Economy* 82 (November 1974): 1287-99.

[10] Frank H. Knight, "Some Fallacies in the Interpretation of Social Cost," *Quarterly Journal of Economics* 38 (August 1924): 582-606; Jacob Viner, "Cost Curves and Supply Curves" in *Readings in Price Theory* (American Economic Association, 1953), pp. 233-42.

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tion that unaided market forces could deal effectively with environmental problems.

Too ready a recourse to excise taxes or other controls was to be avoided. The identification of the "optimal" tax was an extremely difficult task, and the presence of monopolistic and other distortions elsewhere in the economy than in the polluting industry may imply perverse general equilibrium results from an optimal policy in the partial equilibrium context (about which more below). If, however, one characterizes pollution problems in terms of inappropriately defined (or enforced) property rights, the need for regulatory policy tends to disappear. Thus, dealing with Pigou's optimal tax solution to the congested highway problem, Knight characterized the problem as one of the overuse of the scarce highway space as a result of its being treated as a common property resource. From this perspective the correct solution was to treat the highway as private property. Its use would then tend to be automatically priced to reflect the marginal cost of congestion.

This major insight was not developed much further until the seminal contribution by Ronald Coase in 1960.[11] With this contribution the property rights approach was found to contain an impressive set of important and provocative policy implications all of which may not yet have been uncovered. Coase's argument starts with a basic proposition that has become popularly known as the Coase theorem. If there are not any (or negligible) wealth effects and there are no costs associated with transacting private environmental contracts, the optimal solution to any externality problem would be independent of the assignment of liability (or property rights) and would be automatically attained in the market place. Thus, in the factory-laundry example it makes no difference (in the absence of wealth effects and transactions costs) whether the right to pollute is awarded to the factory or the right to be free of pollution is awarded to the laundry. Following E.J. Mishan[12] we may designate the former assignment of rights an L law and the latter an $\overline{L}$ law.

Generally, an L law awards the right to the party generating the negative externality and an $\overline{L}$ law awards it to the party harmed by it.[13] Under the L law the laundry will have to pay (bribe) the factory

[11] Ronald H. Coase, "The Problems of Social Cost," *Journal of Law and Economics* 3 (October 1960): 241-62.

[12] E.J. Mishan, *Cost-Benefit Analysis* (London: George Allen and Union, 1971), chaps. 19 and 52; "Pareto Optimality and the Law," *Oxford Economic Papers* 19 (November 1967): 255-87.

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not to pollute. It will do so only as long as the incremental gains from pollution reduction outweigh the incremental cost of the bribe. And the factory will accept the incremental bribe only if it outweighs its marginal loss in incurring (the lesser of) a reduction in production or an increase in pollution removal. Obviously an equilibrium will involve equality between the marginal benefits and marginal costs of pollution reduction as valued by the parties. At this point the optimum amount of pollution will be produced. The position will be efficient in the sense that both parties will have an incentive to adopt the least-cost alternatives. In this way the externality is automatically internalized; the social costs are automatically reflected in the parties' willingness to "pay for" pollution or its absence.

Under an $\bar{L}$ law the factory would have to compensate (bribe) the laundry to accept incremental units of pollution. It would do so only so long as the value to it of increases in pollution outweighed the lesser of the costs of removing the extra pollution or bribing the laundry. The equilibrium will be identical with that under the L law, with the marginal benefit to the factory of the last pollution unit equal to the marginal cost of that unit to the laundry (for which it is justly compensated). The two cases are exactly symmetrical with the equilibrium outputs of the factory's product, the pollution and the laundry's product unaffected by the choice of law. The distribution of wealth between them, however, will be so affected as well as by the bargaining power of the parties. The uniqueness of the solution arises, as I shall have occasion to emphasize, because the exchange values, at the margin, between the outputs of the factory (its product and its pollution) and of the laundry are independent of the liability assignment.

In summary, if, for any marginal change, the cost to the laundry of the pollution damage is less than the cost to the factory of not polluting (where "cost" refers to the least-cost method), the pollution will be tolerated whatever the law. Under an L law the laundry cannot bribe the factory; under an $\bar{L}$ law the factory can bribe the laundry. Similarly, if, at the margin, the cost to the laundry exceeds the cost to the factory, the pollution will be removed; under the L

[13] A strict interpretation of the Coase theorem requires, as we shall see in a moment, that the notion of "cause" be abandoned once we recognize the reciprocal nature of these problems. The pollution damage may thus be seen to be "caused" by the laundry in choosing to locate next to the factory. If so, the L and $\bar{L}$ law definitions lose meaning. However, in most contexts the activity to be regarded as the "nuisance" is very clear and there will be no ambiguity. Where it is not, it simply requires that we specify the content of the L law.

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law, because the factory will be bribed; under the $\overline{L}$ law because the laundry cannot be bribed. The results generalize easily to all externality situations. In the absence of wealth effects and transaction costs all changes for which the benefits to the gainers outweigh the costs imposed on the losers will be undertaken; all changes for which the benefits of the gainers fall short of the losses imposed on the losers will not. All changes are thus potential Pareto improvements; all changes are efficient.

From the perspective of the Coase theorem, since resource allocation is unaffected by the assignment of liability, the question of responsibility for the pollution is blurred. Where we observe externalities persisting uncorrected it must be because of the existence of prohibitive transactions cost. Pollution is thus no longer a phenomenon attributable to a particular economic agent. Rather it reflects an inability (or unwillingness, given the costs) of all of the affected parties to negotiate externality away.[14] To the alternatives of simply tolerating the pollution or attempting to regulate it must be added that of attempting to redefine property rights so as to reduce transaction costs. The question of "who causes the pollution?" becomes irrelevant if not meaningless, and an appropriate common law response to questions of this nature then becomes: Award the right to whichever party would have been prepared to buy it in the absence of transactions costs.

It is this implication of the Coase theorem, namely, that the courts should respond to disputes involving externalities by awarding rights to those who value them most (as in accident cases, assign liability to the least-cost avoider) that has spurred the large and growing literature on what has become known as the economic approach to the law.[15] Some of the implications arising out of recent debate over this approach will be considered in the next section.

The Coasian challenge to the established Pigouvian framework was taken up by Baumol, who sought to address the following: Coase argued that powerful market forces exist that tend to bring private and social cost into equality without the use of a tax (subsidy). But where transactions costs are high (as in the case of pollu-

[14] It is important to note that "[B]y extending the concept of transactions cost to encompass any inertia or lack of initiative in society, one comes uncomfortably close to the thesis that in economics, whatever is, is best." E.J. Mishan, "The Folklore of the Market," *Journal of Economic Issues* IX (December 1975): 699.

[15] See especially Richard A. Posner, *Economic Analysis of the Law*, 2d ed. (Boston: Little, Brown & Co., 1977). A particularly clear short statement is Harold Demsetz, "When Does the Rule of Liability Matter," *Journal of Legal Studies* 1 (January 1972): 13-29.

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tion with many victims) some kind of interference is necessary. The Pigou solution is formally equivalent to the zero transaction-cost solution.

> Despite the various criticisms that have been raised against it in the large numbers case, which is of primary importance in reality and to which Pigou's analysis directs itself, his tax-subsidy programs are generally those required for an optimal allocation of resources. Moreover . . . where an externality is (like the usual pollution problem) of the public goods variety, neither compensation to nor taxation of those who are affected by it is compatible with optimal resource allocation. Pigouvian taxes (subsidies) upon the generator of the externality are all that is required.[16]

This proposition seems to have some degree of acceptance, even among property-rights theorists. For example, Demsetz has recently argued that

> when the gains or costs associated with particular interactions are not confined to a few parties, but instead are spread thinly over large numbers of individuals, then "high" transactions costs and "free rider" problems may be serious, even when utilizing the best of private property rights definitions, and some attenuation of private rights may be rationalized to achieve a more efficient solution to resource allocation problems. The traditional examples of providing national defense, national foreign policy, and cleaner air come to mind. . . .
>
> High transactions costs and free rider problems sometimes can be resolved by substituting private rights for communal property rights arrangements . . . But this is practical only when the cost of excluding nonpayers is not too high. When dealing with national defense and air pollution problems this does not seem to be the case, and when it is not, a rationalization for action by the state in the name of efficiency becomes available.[17]

Thus, while there may remain some disagreement among efficiency theorists about the policy (or policies) of choice in the face of externalities where small numbers of individuals are affected (although one gains the strong impression that the Coase property-rights approach has strong majority support), when it comes to public goods-type problems this disagreement disappears. The presumption in favor of a (court-encouraged) market solution

[16] William J. Baumol, "On Taxation and the Control of Externalities," *American Economic Review* 62 (June 1972): 307-22. But see Earl A. Thompson and Ronald Bathelder, "On Taxation and the Control of Externalities: Comment," *American Economic Review* 64 (June 1974): 467-71.

[17] Harold Demsetz, "Ethics and Efficiency in Property Rights" in Mario Rizzo, ed., *Time, Uncertainty, and Disequilibrium* (Lexington: Lexington Books, 1979), 97-116.

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evaporates. One suspects that it is because public goods-type problems appear so difficult to deal with on a voluntary basis that we find even the most popular spokespersons for the market explicitly sanctioning a government-imposed tax system as apparently the only alternative to the much inferior regulatory agency approach.[18] The imposition of taxes (subsidies), it should be noted, is ironically advocated in the "name of efficiency"[19] and the market. And, in an ideal world, the ideal tax would strike that balance between "social" costs and benefits that yielded the "right" amount of pollution.

> The real problem is not "eliminating pollution" but trying to establish arrangements that will yield the "right" amount of pollution: an amount such that the gain from reducing pollution a bit more just balances the sacrifice of the other good things . . . that would have to be given up in order to reduce the pollution.[20]

We may call this general approach a *social-cost* approach.

Before concluding I should note that it is widely recognized that *as a practical matter* it is impossible to evaluate the optimal tax. In light of what is to follow it is worth quoting at some length from Baumol:

> . . . we do not know how to estimate the magnitudes of the social costs, the data needed to implement the Pigouvian tax-subsidy proposals. For example, a very substantial portion of the cost of pollution is psychic; and even if we knew how to evaluate the psychic cost to some one individual we seem to have little hope of dealing with effects so widely diffused through the population. . . .
>
> Unfortunately, convergence toward the desired solution by an iterative procedure of this sort requires some sort of measure of the improvement (if any) that has been achieved at each step so that the next trial step can be adjusted accordingly. But we do not know the socially optimal composition of outputs, so we simply have no way of judging whether a given change in the social tax values will even have moved matters in the right direction. . . .[21]

[18] Thus, Milton and Rose Friedman write: "Most economists agree that a far better way to control pollution than the present method of specific regulation and supervision is to introduce market discipline by imposing effluent charges." *Free to Choose* (New York: Harcourt Brace Jovanovich, 1979), 217-18.

[19] See Demsetz, "Ethics and Efficiency."

[20] Friedman, *Free,* p. 215. And Mishan (not particularly enamored with any aspects of the market solution) affirms, citing Baumol and Oates: "Certainly the use of taxes to enforce tolerable standards may yield significant social gains over and above the costs of enforcement." "The Folklore," p. 701.

[21] Baumol, "On Taxation," p. 316. The problem is compounded, explains Baumol, by the fact that where externalities are significant the likelihood of non-convexities and multiple optima increases, pp. 316-18.

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> All in all, we are left with little reason for confidence in the applicability of the Pigouvian approach, literally interpreted. We do not know how to calculate the required taxes and subsidies and we do not know how to approximate them by trial and error.[22]

This being the case, the argument is made in favor of a less precise tax system designed to achieve some reasonable "set of minimum standards of acceptability."[23] Even this may require severe measurement problems but surely no worse than the next best alternative of direct controls.[24] And besides, the tax alternative alleviates the need to use the police or the courts and can be shown "at least in principle, to achieve decreases in pollution or other types of damage to the environment at minimum cost to society."[25]

It is important to note that if we regard the polluter as the active agent, *the tax solution to a pollution problem implies an L law.* The right to pollute, though attenuated by the imposition of a tax like the many other rights, is given to the polluter. So, at least in the public goods case, the social-cost approach implies unambiguously the assignment of rights under an L law. I turn now to a critical assessment of the efficiency framework and the social-cost approach it implies.

Wealth Effects and Second Best

Certain well-known problems with the efficiency framework exist, and these apply in a fairly static, unchanging world. It will be remembered that one of the crucial assumptions necessary for the Coase theorem was that wealth effects were absent (or, at least, negligible). This assumption is often justified with the argument that though the assignment of rights may affect the distribution of wealth, as long as it does not affect the allocation of resources to alternative uses, the distribution question should be kept separate. (The concept of ex ante compensation, also relevant in this context, will be examined in the next section.) But what if the assignment of rights does affect resource allocation, as it plausibly will when wealth effects are significant?

That it should do so is quite obvious upon reflection. The ability to pay, by influencing relative prices, determines the allocation of resources to their highest valued uses. Thus, unless individuals are

[22] Ibid., p. 318.
[23] Ibid., p. 318.
[24] Beckerman, "Pricing," p. 53.
[25] Baumol, "On Taxation," p. 319.

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very similar in their expenditure patterns, any change in wealth will affect relative prices and, therefore, resource allocation. But if relative prices are not variant with respect to the distribution of wealth, they will be affected by the assignment of property rights. As shown originally by Scitovsky,[26] and reiterated many times since by writers on welfare economics, the lack of invariance of relative prices with wealth distributions implies that the Kaldor-Hicks criterion of allocative improvements may yield ambiguous (actually contradictory) results. If situation A is allocatively superior to situation B in that everyone could be made better off by a movement from B to A, a movement from A to B may yield the same result. This apparent contradiction results from the fact that the relative prices that are used to value the outputs in the two situations are different. At one set of prices the goods and services in situation A are valued higher than those in situation B, while at another set of prices the ranking is reversed.

The consequences of this are particularly noteworthy in the context of pollution. The importance of wealth effects on the outcome of any rights assignment can be assumed negligible only if the impact of the assignment on people's overall utility is small. This is often not the case for pollution externalities. As Mishan puts it, "What a person in a noisy environment is willing to pay for continuing quiet may be only a fraction of the minimum sum he is willing to accept to put up with the existing noise, or with the additional noise expected to be generated by a highway or airport to be built near his home."[27] In these cases the choice between an L or an L law will have more than a negligible effect and may indeed imply the difference between the *existence* of a pollution externality and its total absence and that *both situations are, from the property rights viewpoint, efficient.*

The other important assumption underlying the efficiency approach is the absence of significant distortions elsewhere in the economy. The calculation of social costs and benefits is profoundly affected if this assumption is violated. In a world of distortions, where prices are not general equilibrium competitive prices that reflect marginal costs, the imposition of a Pigouvian tax or a liability that would achieve efficiency if distortions were absent may *reduce* efficiency. Assume a polluting factory is producing more than the optimal amount of pollution. Assume further that there are

[26] Tibor Scitovsky, "A Note on Welfare Proposition in Economics," *Review of Economic Studies* 9 (November 1941): 77-88.
[27] Mishan, "The Folklore," p. 701.

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two outputs in the economy complementary to our factory's output and that because of monopoly or taxes (or both) their prices *exceed* their social marginal costs by different proportions. In such circumstances the factory's output *should* be priced below its marginal social cost (to offset the high-priced complements) so that a Pigouvian tax will reduce efficiency. Distortions in the factory market may be even more intractable.[28] These problems of second-best point to the high probability that any attempt at a finely tuned solution is bound to face hopeless information problems in the real world.

It might be thought that it would nevertheless be possible to approximate the general equilibrium outcome by a series of partial adjustments. The remarks of Baumol, quoted above,[29] should dispel that hope. In more general terms, outside of equilibrium there is no way to know if any move is efficiency-enhancing or not.[30] In fact, as we shall see now, the notion of efficiency makes little sense outside of general equilibrium.

The Elusiveness of Efficiency

The concept of efficiency is an appealing one. To be efficient would seem to be a noble aim, achieving any given goal at minimum cost. And when some goals are shared by the members of society, the minimization of "social cost" commends itself. Yet when we move from the perspective of the individual, where the concepts of efficiency and cost make some sense, to that of the society, a careful examination reveals that the efficiency cost-minimizing framework is seriously misleading. This has emerged from a number of recent critical articles on the efficiency of the common law.[31] Though not all of these contributions are relevant to my topic, it is impossible to report on even all those that are. Some

[28] See Mario Rizzo, "Law Amid Flux: The Economics of Negligence and Strict Liability in Tort," *Journal of Legal Studies* 9 (March 1980): 301-02; and idem, "The Mirage of Efficiency," *Hofstra Law Review* 8 (Spring 1980): 652-53.

[29] At note 21.

[30] See Mario Rizzo, "Uncertainty, Subjectivity, and the Economic Analysis of Law," in Rizzo, ed., *Time,* pp. 84-85.

[31] Mario Rizzo at note 28 as well as various articles in the symposia editions of *Journal of Legal Studies* 9 (March 1980) — "Change in the Common Law: Legal and Economic Perspectives," *Hofstra Law Review* 8 (Spring 1980) — "Symposium on Efficiency as a Legal Concern," and 8 (Summer 1980) — "A Response to the Efficiency Symposium." Also, Murray Rothbard, "The Myth of Efficiency," and John B. Egger, "Comment: Efficiency Is Not a Substitute for Ethics" in Rizzo, ed., *Time,* chaps. 4 and 5, respectively.

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brief remarks on the essential points, nevertheless, are of immediate relevance.

In my remarks so far I have been treating the efficiency approach (to the law and to Pigouvian taxation) as a normative theory, a theory of optimal policy. In the literature there has been a tendency to move from normative proposition to assertions about the actual evolution of the law in practice, claiming, with greater or lesser confidence, that the common law tends to be efficient.[32] Any problems relating to the efficiency concept as a normative ideal will be seen to apply with equal force to the concept of efficiency as an empirical standard.

Efficiency is understood here to mean the maximization of social wealth as measured by ability to pay.[33] Any administrative decision-maker, whether it be a judge imposing a liability or an agency imposing a tax, to maximize social wealth must calculate the social benefits and costs consequent upon its actions. If we treat social costs as the social benefits forgone, we may talk simply of maximizing social benefits or minimizing social costs. This presumes that social cost is (at least in principle) an identifiable entity. The notion of cost in general bears further examination.

Most, if not all, economists would agree that when the term "cost" is used it should refer to what is often loosely called "opportunity cost." The implications of a rigorous opportunity-cost concept for much of modern economic theory would, however, be too devastating to bear, so that most economists are thoroughly inconsistent when it comes to applying the concept of cost. Opportunity cost correctly understood[34] refers to the *individual* decision-making

[32] See Richard Posner, "The Ethical and Political Basis of the Efficiency Norm in Common law Adjudication," *Hofstra Law Review* 8 (Spring 1980): 487-508; Paul H. Rubin, "Why is the Common Law Efficient?," *Journal of Legal Studies* 6 (1977); George L. Priest, "The Common Law Progress and the Selection of Efficient Rules," *Journal of Legal Studies* 6 (1977); among others.

[33] See, for example, Ronald M. Dworkin, "Is Wealth a Value?," who writes "Wealth maximization as defined is achieved when goods and other resources are in the hands of those who value them most, and someone values a good more only if he is both willing and able to pay in money (or in the equivalent of money) to have it." *Journal of Legal Studies* 9 (March 1980): 191. I should add that though Dworkin is highly critical of the efficiency approach, this definition is not contested by those he is criticizing. This is clear from Richard Posner, "Utilitarianism, Economics, and Legal Theory," *Journal of Legal Studies* 8 (January 1979): 119-120.

[34] For a most complete statement see James M. Buchanan, *Cost and Choice* (Chicago: Markham, 1969). Also relevant to this reviving tradition is James M. Buchanan and G.F. Thirldry, eds., *L.S.E. Essays on Cost* (New York: New York University Press, 1973). I have treated this in P. Lewin, "Perspectives on the Costs of Inflation," *Southern Economic Journal* 48 (January 1982).

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process. In making a rational choice at a point of time, the individual must weigh the perceived alternatives. The cost of choosing any one alternative is related to the opportunities sacrificed by forgoing all the others and may be expressed as the utility forgone on the next best alternative. From this perspective three propositions about cost follow. 1) Cost is borne exclusively by the decision-maker. Obviously, one person's decision may influence the costs borne by another but, if understood correctly, any cost must attach to an individual out of choice. 2) Cost is inherently subjective. First, it is expressed in utility terms making it noncomparable across individuals if adherence to an ordinal utility concept is to be maintained. Second, cost implies subjective expectations. It refers to the *perceived* alternatives; it relates to an *imagined* future. The alternatives at any point of time exist only in the mind of the decision-maker, and although there may be some degree of consensus concerning hypothetical imagined future prospects, there almost certainly will remain a divergence of expectations. Thus, costs cannot be measured by an outside observer. 3) Cost is unrealizable. Once a choice is taken the hypothetical imagined future evolves with time into the *actual* future and the displaced alternatives cease to exist. There is no way to verify if they were really alternatives. Stated differently, the fact that the concept of costs involves counterfactual alternatives renders it unrealizable.

This insistence on a thoroughgoing, subjective opportunity-cost concept may strike the reader as excessively purist. Its importance may be sharpened, however, if we attempt to relate it to the notion of cost more common in everyday speech (and in applied economics).

Once a decision is taken, certain consequences, like money outlays, follow. These are not, strictly speaking, costs. They are choice-induced, not choice-influencing; they do not represent forgone opportunities in any direct way. In a very restricted sense and in very constrained circumstances, the money outlays and market prices that we observe can represent costs. If there are no nonpecuniary elements unique to individuals involved in the choices concerned, and if full competitive equilibrium prevails in an unchanging environment so that there is no uncertainty about future outcomes (i.e., imagined future alternatives can be taken to represent actual alternatives), then market prices will represent individuals' evaluations, at the margin, of the traded goods and services in terms of each other (and money). Of course, in terms of utility these costs are still not objectifiable, but in the postulated

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conditions, they do represent an accurate reflection of traders' preference orderings and could be used to interpret, explain and perhaps predict hypothetical decisions. But these objective costs are the *results* of choices that occur in equilibrium (where plans and outcomes coincide). They cannot reflect perceived alternatives outside of this equilibrium. Outside of equilibrium, perceptions of alternatives differ and cost is inescapably subjective.

In any actual dynamic economic process, where the future is, in some respects at least, radically different from the past (such as is often the case with technological changes that could not have been anticipated), expectations will diverge. A strict application of the opportunity-cost concept is thus bound to lead one to the conclusions that costs are individual and private and cannot be "social." The social-cost concept requires the summation of individual costs, which is impossible if costs are seen in utility terms. The notion of social cost as reflected by market prices (or even more problematically by hypothetical prices in the absence of a market for the item) has validity only in conditions so far removed from reality as to make its use as a general tool of policy analysis highly suspect.

In externality situations where the disputing parties are small in number, the efficiency approach would favor a common law solution requiring the court to simulate a market condition by awarding the right in question to the party who would have bought it if a market devoid of transactions costs had existed. In light of the foregoing discussion on the nature of costs, one may ask not only how this is possible but, more pertinently, what notion of efficiency is being served here. In making such a determination the court would have to weigh the consequences of alternative resource allocations and somehow estimate and evaluate their effects. Among the problems that exist are the following:[35] 1) The time frame is arbitrary. Over how long a timespan are the forgone alternatives projected? As the doctrine of "the last clear chance" applied to accidents illustrates,[36] the "efficient" solution may vary with time frames. Also, the longer the horizon chosen, the more uncertain the outcomes. How is one to know which timespan "the market" would have chosen?

2) Often what is being disputed is the very nature of the external effects. Where, for example, eminent scientists may disagree about

[35] In addition to the articles by Rizzo, Rothbard and Egger referred to above, see Gerald P. O'Driscoll, "Justice, Efficiency, and the Economic Analysis of Law: A Comment on Fried," *Journal of Legal Studies* 9 (March 1980): 355-66.
[36] Rizzo, "Law Amid Flux," p. 300.

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the effects of low-level radiation and acid rain, how are the courts to decide? Where it is possible to attach a probability to the likelihood of a harm of a specified market value occuring, such as in insurance situations where the events in question are part of a homogenous class of repeatable events, the notion of "least-cost insurer" may be meaningfully applied in pursuit of an efficiency standard.[37] But where the events in question are inherently unforeseeable in that they are in no meaningful sense part of a class of repeatable events over which a probability distribution could be defined, no efficiency criterion is possible. Whatever the court does could be construed as efficient given its own (subjective) probability assignment. In this category of events would fall all those harms (including irreversible environmental catastrophes) whose long-term effects are uncertain (sometimes because they are so new that experience is totally lacking). If one adopted the principle that no harm will be assumed unless and until relevant information is available, one applies an L law by default. Mishan has observed that "such a principle amounts to the methodological rule: When in doubt, continue to pollute."[38]

Even if the effect of the externality could be accurately identified, it would still be impossible to determine the least-cost method of pollution reduction in a dynamic setting; for what is least-cost with today's technology may be relatively expensive with tomorrow's.[39] And whose cost are we talking about? The cost of any option will vary among individuals insofar as their value scales and expectations of future technological development differ. A new pollution control device may be invented by the factory if the right to be free of the pollution is awarded to the laundry, but the incentive to do so is diminished if pollution rights are awarded to the factory. While the laundry then has the incentive to do so, it may be at a serious disadvantage being unfamiliar with the factory's production process and unable to learn about it except at considerable cost. As Rizzo has remarked, what is involved is "fundamentally a question of predicting the future course of technology under alternative incentive arrangements. Clearly this is an impossibility because the growth of technology is essentially the growth of knowledge, and future knowledge, by definition, cannot be obtained in the present."[40]

[37] Where events that cause harm are recurring with predictable frequency in large populations, assigning liability for harm to the least cost insurer would be efficient in the long run in that the "optimum" level of precautions would be taken.
[38] Mishan, "The Folklore," p. 701.
[39] Rizzo, "Law Amid Flux," p. 307.

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All this applies with even greater force to the case of an externality affecting many parties. Here the notion of social cost is even more obscure. If it is an administrative agency that is charged with the responsibility of implementing the efficient policy, it will face the same problems of having to choose among time frames across disparate individual evaluations in the face of an inherently uncertain technological future. It is important to emphasize that it is precisely where administrative action is called for that it is least able to apply an efficient rule. For an efficient rule implies simulating the market, but market data on which to base a decision are absent owing to the "market failure" that motivated the administrative action in the first place.

The foregoing suggests that any perception of efficiency at the social level is illusory. And the essential thread in all the objections to the efficiency concept, be it wealth effects, distortions, or technological changes, is the refusal by economists to make interpersonal comparisons of utility. Social cost falls to the ground precisely because individual evaluations of the sacrifice involved in choosing among options cannot be compared. If we were willing by a leap of faith to compare hypothetical satisfactions (accepting at the same time the policy-maker's projections for the future), the notion of social cost might be salvaged, but only if it is understood as a metaphor for the real or hypothetical decision-maker's cost. Our reluctance to compare utilities reflects a very basic theoretical conviction that individuals should be taken to be the best judges of their own welfare. Thus, we consider market transactions as welfare-enhancing (assuming no spillovers) because they are entered into voluntarily. The principles of autonomy and consent come to mind. From this perspective it is difficult to see how any involuntary transaction (one that does not occur through the market) could be judged efficiency-enhancing.

Posner has attempted to deal with this problem by suggesting that an efficient legal system, by reducing social costs, would provide everybody with an equal chance to gain sometime, somewhere from the "better" system.[41] So an individual harmed without compensation by an externality may, nevertheless, be considered to

[40] Ibid., p. 308. There is a related point. If there is uncertainty as to who is the long-run, least-cost avoider of a harm, and if the court is known to be operating under an efficiency standard of liability, then there is necessarily uncertainty about who is likely to be held liable. This will inhibit the operation of the "correct" incentives in which proponents of the efficiency approach put such store.

[41] Posner, "The Ethical," pp. 491-94.

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have consented to it on the grounds that the shoe might have been on the other foot and probably will in some future situation. As a result of the more efficient system, the pie is bigger and all have a chance of sharing it. In this sense compensation has been made ex ante. "If there is no reliable mechanism for eliciting express consent, it follows, not that we must abandon the principle of consent, but rather that we should look for implied consent, as by trying to answer the hypothetical question whether, if transactions costs were zero, the affected parties would have agreed to the institution. This procedure resembles a judge's imputing the intent of parties to a contract that fails to provide expressly for some contingency."[42]

Even if one is willing to forgo the objection (of which Posner is aware) that implied consent is not express consent on the grounds that it is too "costly" to obtain express consent, how is one to infer implied consent for a more efficient system when, as I hope I have shown, the very concept of efficiency as applied to society is meaningless? As Kronman pertinently asks, "[H]ow are we to distinguish those cases in which there has been ex ante compensation from those in which there has not?"[43]

One is left with the strong impression that if efficiency means anything, then *rights are logically prior to efficiency.* Efficiency is a result of maximizing social wealth, and social wealth is evaluated by individuals expressing their ability and willingness to pay. But ability and willingness to pay depend on wealth, and wealth depends on prior rights assignments. Thus, the way in which individuals would evaluate any resource depends on the prior assignment of rights. To attempt to base an entire system of law on such a flawed concept as social wealth seems to be an exercise in futile circularity. Yet, as we shall see, the utilitarian impulse is a difficult one to avoid, especially in the context of pollution externalities.

Strict Liability

If Not Efficiency, Then What?

An alternative basis on which to deal with pollution-type questions may be provided by a strict liability approach to rights.

[42] Ibid., p. 494.

[43] Anthony T. Kronman, "Wealth Maximization as a Normative Principle," *Journal of Legal Studies* 9 (March 1980): 227-42. See also the penetrating critique of Posner's "ex ante compensation" concept by Ronald Dworkin "Why Efficiency," *Hofstra Law Review* 8 (Spring 1980): 573-90. Also see Rizzo, "The Mirage," pp. 654-58.

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Recently Richard Epstein in a series of articles has attempted to provide a systematic account of how the principles of strict liability could be applied to various circumstances.[44] Such a system is designed not to assign but to discover rights (on the basis of certain, sometimes unstated, ethical presumptions) or to discover when rights have been invaded in order to apply "corrective justice."

Epstein suggests basic common sense be used as an aid to determining the correct nature of causes and responsibilities. Causal principles are needed to identify the source of any invasion of rights. "A is liable, at least prima facie, if he is the cause of B's harm, regardless of A's ability or inability to avoid the harm . . ."[45] Esptein defines his causal ideas in terms of four simple paradigms: 1) A hit B; 2) A frightened B; 3) A compelled B to hit C; and 4) A created dangerous conditions that resulted in harm to B. Of these, 4) and 1) seem to hold the most relevance to pollution problems.[46]

If, as I have argued above, the efficiency arguments emanating from the Coase theorem fail in their attempt to provide a consistent basis for the conduct of policy to deal with pollution, it seems natural that causal principles should re-enter the picture. By definition, he who violates the rights of another causes him harm. So, once again, rights must be defined prior to any legal analysis. Epstein appears to favor a basic libertarian, natural-rights view that everyone is the unambiguous owner of his (her) body and of property acquired through voluntary exchange or original appropriation.[47] And in most cases involving a small number of individuals, applying this notion of rights to the four basic paradigms provides unambiguous criteria for establishing a prima facie case of harm. The only relevant question is, did A violate B's rights or cause C to

[44] Richard A. Epstein, "A Theory of Strict Liability," *Journal of Legal Studies* 2 (January 1973); "Defense and Subsequent Pleas in a Theory of Strict Liability," *Journal of Legal Studies* 3 (January 1974); "Pleadings and Resumptions," *University of Chicago Law Review* 40 (Spring 1973); "International Harms," *Journal of Legal Studies* 4 (June 1975); "Nuisance Law: Corrective Justice and Its Utilitarian Constraints," *Journal of Legal Studies* 8 (January 1979).

[45] Mario J. Rizzo, "Foreward" in Richard A. Epstein, *A Theory of Strict Liability* (San Francisco: Cato Institute Reprint, 1980), p. xi.

[46] Epstein, "Nuisance Law," p. 56. As Rizzo remarks (ibid., p. xi) these paradigms presuppose an ability to recognize an instance of any one of them and are perhaps better thought of as *classes* of causal relation.

[47] Epstein, "Nuisance Law," p. 52. "Each person owns his own body as a natural right. . . . It is more difficult to obtain agreement about the correct rules that in principle govern the acquisition of land or chattels. But for the purpose of tort law it is sufficient that the system has, in fact, settled upon the criterion of first possession . . . . coupled with rules that govern the transfer and alienation of the property rights so created."

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do so? This involves a two-step procedure: 1) Identify an event or series of events that harmed B; and 2) connect this to an act or acts of A. Though there may be considerable uncertainty involved in both steps, purely economic considerations apparently do not enter into this phase of the analysis at all. It is necessary in the first step to specify the type of conduct that will be considered a violation of a plaintiff's rights. Some cases are clear-cut, like physical violence, extortion, and simple trespass. But some cases are more problematic. Among these are those that are classified as nuisances. "Nuisances are invasions of the plaintiff's property that fall short of trespasses but which still interfere in the use and employment of land. The cases make it quite clear that the forms of nontrespassory invasions are protean: Fumes, noises, smells, smoke, gases, heat, vibrations, and kindred activities."[48] In this sense pollution would appear to be a nuisance type invasion.

Having identified a nuisance, it is then necessary to link it to the defendant's actions. The ability to demonstrate fulfillment of steps 1 and 2 will then establish a prima facie case. In Epstein's scheme defenses can be made on the same paradigmatic grounds as the complaint. So, "B compelled A to hit him" is a valid defense against "A hit B." Other defenses exist as well: They are trespass and assumption of risk (either consensual or unilateral by the plaintiff). But if the plaintiff prevails, damage must be assessed, and some type of economic reasoning cannot be avoided. Summarizing, under this view, the investigation of the rights involved would appear to be prior to any examination of damage. Once an invasion has been established and a party found responsible, the question of relief can be addressed as a separate issue.

It should be emphasized that whenever the court would have to estimate the compensation necessary to make the plaintiff whole (whether injunctive relief was used or not) it would face the same difficulties discussed above in connection with the attempt to achieve an efficient outcome. Counterfactual assumptions cannot be avoided whenever a harmful event (which might not have occurred) is analyzed. The damage assessed must then be related to

[48] Ibid., p. 53. But compare Murray M. Rothbard, "The vital fact about air pollution is that the polluter sends unwanted and unbidden pollutants . . . . *through* the air and into the lungs of innocent victims, as well as onto their material property. All such emanations which injure person or property constitute agression against the private property of the victims. Air pollution, after all, is just as much aggression as committing arson against another's property or injuring him physically. Air pollution that injures others is aggression pure and simple." *For a New Liberty* (New York: Collier Macmillan, 1978), p. 256.

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the difference between the state of the world as it actually is and as it *would have been* had the event not occurred. And since the parties have opposing incentives influencing the value they place on the harm, the court cannot but impose its own. In doing so it is necessarily attempting to empathically identify with the plaintiff and arrive at the pecuniary equivalent of the utility lost. This would appear to be an unavoidable ingredient of any justice system.

Still, a system of strict liability seems to preserve the advantage that though damage remains, to a greater or lesser extent depending on the complexity of the case, an uncertain element, the rights involved are clearly delineated and do not depend on any counterfactual determinations. The system should always apply an $\bar{L}$ law rather than an L law and should always be inclined to grant injuctive relief against violations of rights; so that apart from the estimation of damages, the system does not contain that element of arbitrariness in the assignment of rights that inheres in the efficiency arguments.

Two difficulties, however, remain. The first is that it is not always obvious when a right has been violated, although from a libertarian standpoint, common sense goes a long way. Thus, the blocking of a view, the blocking of light, and the creation of aesthetically displeasing structures are among a similar class of actions that do not constitute a violation, while the shining of light, creation of noise, etc., do. The physical invasion by a particle or wave of light, noise, or matter would seem to make the difference. Pollution occurs when many such invasions take place, creating direct harm or dangerous conditions.[49]

The second difficulty is much more important. An invasion may occur where the damage is small and/or the transactions and/or litigation costs (including the costs of administering the system) are high. In such cases there is a temptation to use economic criteria to implicity redefine and attenuate rights. This is particularly true in public goods situations where, for example, there are many pollution victims. "The nuisance law, unlike the law of accidents, does present abundant situations in which . . . utilitarian constraints militate in favor of redefinition of property rights and liability rules without explicit compensation."[50]

The problem seems to be that certain situations, while being clear cases of rights violations under a strict liability standard, are judged by most people to be generally (socially?) beneficial. Epstein

[49] Epstein, "Nuisance Law," pp. 56, 60-65.
[50] Ibid., p. 82.

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presents some "rules" by which the strict liability outcome may be mitigated, among which are the "live and let live rule" and the "locality rule."[51] These rules can be briefly summarized as follows: 1) Live and let live: ". . . those acts necessary for the common and ordinary use and occupation of land and houses may be done, if conveniently done, without submitting those who do them to an action . . . It is as much for the advantage of the owner as of another, for the very nuisance the one complains of, as the result of the ordinary use of his neighbor's land, he himself will create in the ordinary use of his own, and the reciprocal nuisances are of a comparatively trifling character."[52] 2) Locality rule: "The function of the locality rule is to relax the basic nuisance rules where parallel uses by nearly all concerned insure the existence of implicit in-kind compensation."[53]

It should be clear that the ethical basis for these rules is similar to that advanced by Posner in justification of an efficiency standard, namely ex ante compensation and, therefore, implicit consent. As such, it is subject to the same objections. Instead of just deciding whether an invasion of rights has occurred, the court must now decide whether the appearance of such a violation is actually belied by the presence of ex ante compensation. And the latter thus calls for a judgment as to the social value of certain activities *in the process of determining rights.* Might it not be better to maintain as pure a theory of corrective justice as possible when determining rights and leave such speculations to the damages? In the conditions pertaining to the two rules in question this would imply that the incentive to litigate would be negligible and the problem would thus take care of itself. On the other hand, where (as in the "live and let live" situation) "the reciprocal nuisances are of a comparatively trifling character," the expected benefits of litigation are small. On the other hand, where large numbers are involved, unless the expected payoff is large, the transactions costs of joint litigation are likely to be prohibitive. This last consideration is mitigated to the extent that class action litigation is possible. But the conditions necessary to provide a basis for class certification are unlikely to apply in very many situations of this type.[54]

[51] Ibid., pp. 82-90.
[52] Ibid., p. 83, quoting Baron Bramwell's opinion in *Bamford* v. *Turnley* 3 B. & S. 55, 122 Eng. Rep. 27 (1862) at 83-84.
[53] Ibid., p. 90.
[54] In fact, as Rothbard points out (*For a New Liberty,* p. 258), class action suits are prohibited for air pollution cases.

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An alternative (or complementary) approach is to use the concept of *homesteading* to define rights. What this implies is that the first occupier and user of a resource acquires a property right in that resource. One would extend this line of reasoning to air pollution, noise pollution, and so on.[55] Thus, where a producer acquires land and has preceded his neighbor in emitting air pollution, the neighbor has "come to the nuisance" and has not suffered any legal harm. Similar easements in a certain level of noise emission could be acquired.[56]

This approach implies the establishment of an $\overline{L}$ law but with stringent standards of proof to be borne by the plaintiff. But sometimes it appears impossible to establish an $\overline{L}$ law. Epstein gives the examples of highway traffic delays and automobile air pollution. The damages are "public" and private law mechanisms are apparently incapable of dealing with them. "When these conditions occur direct public regulation is the only possible way both to reduce harmful outputs and to equalize treatment across individual cases."[57] We are back to a Pigouvian tax and an implicit L law.

What Epstein fails to emphasize is that the root of the problem is that the highway and the air are not privately owned. Technically, there is no problem imagining private ownership of highways. And Rothbard has argued,[58] for example, that there are no "true" public goods of any kind, certainly not in water or on the land, which can, in principle, be parceled out. But what about the air? Rothbard suggests that allowing class action suits (under an $\overline{L}$ law) would provide the remedy.[59]

But having said this, two final difficulties remain: 1) Although one may agree that the bounds of human ingenuity in devising schemes of private property rights have hardly been stretched, there do appear to be situations that defy all such schemes. Examples are of the multiple tortfeasor type, like automobile air pollution. Here one may have to reluctantly agree that public regulation seems inevitable.[60] 2) A related point. Even it if were possible *in principle* to establish comprehensive property rights, in practice this will not be done. Our current difficulties in this regard may simply reflect our

[55] For a detailed argument see Murray N. Rothbard, "Law, Property Rights, and Air Pollution," *Cato Journal* 2 (Spring 1982): 55-99.
[56] Ibid.
[57] Epstein, "Nuisance Law," p. 7.
[58] "For a New" pp. 255-259.
[59] Ibid., p. 259.
[60] See Dolan, *Tanstaafl,* chap. 3, for an automobile pollution control scheme that preserves many of the features of the market.

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refusal to do so in the past.[61] Automobiles would not have been made the same way if manufacturers had been enjoined from producing pollution damage in the distant past. Too many activities now common would be subject to injunction. How does one proceed, under a system of corrective justice, in such an imperfect world? I may conjecture that it would not entail the abandonment of corrective justice principles but merely the recognition that since they cannot be (or will not be) implemented, second-best alternatives must be considered. But if we can avoid making a virtue out of the need to compromise, we may succeed in the future in reducing the need to compromise.

[61] Although not necessarily. Sometimes our current difficulties may reflect the changing state of knowledge. We may at one time adopt a technology that we believe to be perfectly safe and only later (when it is already firmly integrated into the industrial infrastructure) learn that it is hazardous and invasive.

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IMPOSED RISK CONTROVERSIES: A CRITICAL ANALYSIS

Gerald L. Sauer

The dice should be loaded against any "right" to protection against risk.

—Aaron Wildavsky (1980, p. 39)

Introduction

In recent years much has been written on the general subject of risk of physical harm. The topic has been widely discussed by policy analysts, economists, ethicists, lawyers, scientists, and others (see references).

In this paper I will focus on risk controversies of a familiar type: Someone in one locale is concerned about being seriously injured as a result of human activities carried on elsewhere. The discussion will be limited to risks that are unintentional in the sense that no one is deliberately threatening others or desires their harm. Examples are controversies over nuclear reactors, dams, toxic pollutants, and biological laboratories containing virulent organisms.

The controversies can be termed ones of "imposed risk." As such, they raise a number of fundamental questions:

1. When has a risk of physical injury been "imposed" on someone, and when has it resulted from an agreement, or been "accepted" or "assumed"?
2. When are we justified in stopping someone from imposing a risk and on what normative basis?

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3. Who should bear which costs and burdens of the argument in the resolution of risk disputes?
4. Would imposed risk be better dealt with by a common-law approach rather than a legislative and regulatory one?

The Problem Delineated

Energy and Harm

The immediate cause of physical injury is energy in various forms: Mechanical, as when machinery flies out of control; gravitational, as when a dam bursts or a tall building topples over; chemical, as with fires, explosives, and pollutants; biological, electromagnetic, or nuclear.

When is Risk Imposed?

For a risk of harm to be imposed, other people must be responsible for the potentially harmful form of energy. Excluded, then, are fears over "acts of God," in which the harmful form of energy is purely the product of nature, such as tidal waves. Also excluded are self-created risks, in which someone has created through his own actions the harmful energy that threatens him, as in starting a fire. In the case of defective products, one might be harmed "as a result of" the actions of others; but strictly speaking, the risk has not been imposed.

In general, much exposure to risk would not result except for prior agreements between those at risk and those responsible for the energy or the locale in which the exposure takes place. These risks must also be ruled out as "not imposed." Examples are risks from purchased products that are combustible, toxic, or otherwise hazardous on their own. Also excluded are the dangers at a location where one is an employee, customer, or other type of "invitee." In particular, the risks of using a road are "not imposed." Strictly speaking, the risks encountered by trespassers also are not imposed.

In determining whether such risks are "excessive," one must look to the agreements and understandings from which they arose. Normatively, the issues are very different from cases of imposed risk.

In cases of imposed risk, someone in one locale is concerned about being harmed by some form of energy that others create, control, or manage somewhere else. For the harm to occur, there must

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be a flow of energy across property lines or boundaries. Usually, the flow is into the locale in which the harm occurs, although there are examples in which the flow is reversed. (Consider excavation at the base of a hill that causes a landslide on residential lots further up.) In this paper "invasion" will be used to describe the flow of energy across boundaries regardless of the direction.

Imposed-risk controversies can arise over both potential and actual invasions. In controversies of the first type, the issue is whether or not an invasion, assumed to be harmful, will in fact occur. Typically, such controversies involve "potentially mischievous stores of energy," such as the water walled up behind a dam. Controversies over actual invasions, on the other hand, center on the extent to which an invading substance is in fact a threat to health. Prominent examples are disputes over low-level emission of substances that are known to be toxic at higher concentrations, e.g., radiation from nuclear and coal plants. Typically, the invasions are so small in size that they are unobjectionable except for their possible toxicity.

Foreseeability

In characterizing imposed risk there is one more factor to consider — foreseeability. It should be noted that in many risk controversies, foreseeability is not an issue. Major controversies typically involve new technologies being employed in already populated areas in a manner that no one could have foreseen. To argue that people already there have "assumed" or "accepted" the risk is to presume they made a deliberate choice that never took place. When is a foreseeable risk accepted or assumed and so not imposed? There are two cases to consider depending on whether the potentially harmful energy is created before or after those at risk move into the vicinity.

First, suppose someone moves to a locale where he knows his health could be endangered from an industrial facility nearby. Has the risk been imposed? Strictly speaking, no, but it may have been imposed on the previous owner. And if so, why shouldn't the previous owner be able to pass onto the new one whatever rights he had against the imposition? A right that has been violated should not disappear just because its possessor transfers something that was his to exchange in the first place.

The other case is when someone moves to a locale and it is "foreseeable" that the risky activity will later be located nearby. Literally speaking, the risk has been imposed, since initiation of the activi-

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ty puts the risk on someone already in the vicinity. Some might argue, on the other hand, that the risk has been accepted or assumed and that it was up to the person moving in to avoid the risk by purchasing additional land rights or locating somewhere else.

There are at least three problems with the latter view. That one can foresee future actions of others is debatable. What looks obvious in hindsight may require unusual alertness and intelligence to foresee. Secondly, this view opens the door to extortion. One can threaten to initiate all kinds of foreseeably risky activities, unless one is paid off in advance. Finally, to protect against far-reaching accidents, one would have to purchase land rights over a large surrounding area. Because of these difficulties, the "foreseeability" view will be rejected here. Risks arising after the acquisition of land will be considered "imposed."

The intellectual problem raised by imposed risk controversies is how to reason to their resolution in a generally compelling manner. Ideally, the logic should be so fundamental and deeply rooted in human nature that all parties to the controversy find the reasoning cogent. In the next section we turn from the characterization to the normative analysis of imposed risk.

Alternative Normative Approaches

Respect for Persons

Is there anything universal about human beings to which we can appeal to resolve risk controversies? The great diversity of values and beliefs would seem to indicate not. There is, however, at least one characteristic that we share: We all choose goals and pursue them. And in pursuing our ends, we want our persons and our activities to be physically respected by others. We do not want others to injure us or to disrupt our activities without a compelling justification. This is true for both sides in a dispute over risks.

In risk controversies, however, the wish to be respected logically cuts both ways. On the one hand, it is only rational for people to be concerned about "significant" increases in health risks. Health, after all, is fundamental in that it is a sine qua non for all activity. On the other hand, the desire to be free from meddlesome restraints governing every conceivable risk is also only rational in that such restraints would paralyze all activity. The two sides of the issue are logically linked and neither can be pushed to an extreme without ending up in inconsistency. The horns of this dilemma will be further examined below.

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The only way to avoid impalement is to hold that "significant" risks should be enjoinable, and "trivial" ones allowed. But which risks are which and what of any grey matter in between? In the next section I will attempt to delineate the distinctions relying on the desiderata of respect, impartiality, and objectivity. The end result will be some approximate quantitative standards for resolving risk controversies. Unlike the cost-benefit approaches to risk currently in fashion, the delineation will not proceed in terms of economic values. Efficiency, cost, and willingness-to-pay will have a role to play in borderline cases, but these considerations are highly constrained by more dominant "ethical" ones.

To put the framework to be developed in perspective, it is worthwhile first to consider the difficulties of alternative normative approaches.

The Outer Extremes

Two extreme positions bound all approaches to imposed risk. The first is to allow legal remedies only for harm that has already occurred and to have no remedies for risk *per se*. The second is to prohibit all risk.

The "no prior remedies" position is the most palatable when coupled with a policy of strict liability for any harm arising from imposed risk.[1] This is because strict liability gives people a strong incentive not to create risks for fear of having to pay large damage settlements. But even assuming strict liability for actual harms, what is wrong with complete laissez-faire for risk?

The answer, of course, is that people will sometimes create substantial risks through misjudgment or simply through carelessness. Strict liability is cold comfort to those at risk because it is far from a perfect system of insurance or restitution. The *best* someone at risk can expect should he be injured is to be compensated. But if the injurer is insolvent, the compensation will be inadequate. A requirement that risk-creators carry adequate insurance does not save the "no prior remedies" position. For many people, death or serious injury is not financially compensable.

Assuming that people value their health more than financial reward, it would be only rational to want to intervene in the hazardous activities of others to protect against serious risk. This would reduce individual freedom and may result in higher costs, but these are only secondary concerns in comparison with the loss of health.

[1] For a theory of strict liability, see Epstein (1980).

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If the other extreme — the prohibition of all imposed risk — were in force, one would have to have the consent of all those who might possibly be harmed. To fly a plane, for instance, would require the permission of all those living below the route. To light a fire might require consent of the entire community.

Clearly, then, both positions must be rejected as irrational, and the task remains of finding a satisfactory normative basis from which to draw the line between enjoinable and allowable risks.

Utilitarianism and Economics

One can attempt to determine risk policy primarily on the basis of its social consequences. Below, "utilitarian" will refer to all such attempts to base policy on the desirability of its results, such as with cost-benefit analysis.

Within the modern utilitarian tradition, Bayesian decision theory sheds light on the paradox of "the value of life," on how to make complex safety/cost tradeoffs consistent with one's fundamental preferences, and on how to make such tradeoffs on behalf of others when delegated to do so (Howard 1979). Also, economic theory can be used to demonstrate how imposed risk and its legal remedies can be less than ideally efficient. Lastly, the general utilitarian problem — how to choose fairly the action or rule that leads to the "greatest expected good" — has been rigorously analyzed (Harsanyi 1979).

Attempts, however, to draw normative conclusions about imposed risk on the basis of these theoretical results run into several logical, ethical, and informational problems. Assume that someone would voluntarily incur a risk in exchange for benefits either for himself or others. From this, it simply does not follow that the risk should be imposed on him so long as the benefits are forthcoming. There is a logical and ethical gulf between voluntary preferences (the bedrock of Bayesian decision theory and economic analysis) and conclusions about imposition. Even if one embraces the maxim, "Do what is good over all," and the person to be put at risk agrees that the benefits outweigh the risk in a utilitarian sense, the risk should not necessarily be imposed on him without his consent.

Still at issue is the ethical treatment of that person. Standard utilitarian analysis, which focuses on the consequences of policies and ignores what might be termed "procedural values," begs this fundamental issue of treatment. To the extent that people want to be respected in their choices and pursuits, such analysis is constantly in danger of yielding counterintuitive and invalid results.

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One can attempt to salvage utilitarian approaches by incorporating respect for persons explicitly into the analysis. This raises the interesting question of whether treatment considerations wouldn't ordinarily so dominate the analysis that the usual consequential considerations could be ignored. (How often is respect for persons really at odds with the attainment of a more efficient or better society?)

Resolving this question, however, is not crucial; the utilitarian approach flounders on informational grounds alone.[2] Utilitarian policy assessments turn on judgments about people's particular values and needs and on how they will respond to the policies under consideration. Such judgments are necessarily highly subjective and hence, too indefinite and intellectually slippery to resolve legal controversies on a compelling basis.

In addition, there are the difficulties of planning under utilitarian policy. Decisions about the future can be made, at best, with only a hazy sense of how subsequent controversies over the planned activities will eventually be resolved. If risk policy is not to make a mess of the pursuit of ends, it must be more objectively based than utilitarian analysis.

Rights

Over the last decade rights theorists have strongly criticized utilitarian approaches to law and developed extensive theories of justice based on a variety of normative principles (Nozick 1974; Rawls 1971; Rothbard 1981). Existing rights theories, however, are unclear in their implications on issues of imposed risk.

Perhaps the most definitive is libertarian rights theory, which focuses on the legitimate and illegitimate use of force against individuals. Libertarian theory assumes that everyone has a property right to his own person and that no one may initiate force against another as long as that person has not violated the property rights of others (Rothbard 1981). Imposed-risk controversies do not involve the initiation of force that might result in harm to others. But given only this, libertarian principles are inconclusive.

"Clear and present danger" is sometimes cited as the correct criterion for intervention, but without sufficient explanation or justification (Gibson 1981, p. 2). Also modern technology raises serious questions about the stringency of the criterion. Suppose, for

[2] For an informational critique of the idea of basing law on economic efficiency considerations, see Rizzo (1980).

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instance, that one sees trucks loaded with drums marked "toxic" regularly pulling into the woods of a neighboring farm. The ground water beneath the farm and the surrounding area is the region's source of drinking water. This farm has recently been purchased by an "outsider," whom no one in the surrounding area has met. Inquiries about what is going on are met with polite but firm rebuffs. "No Trespassing" signs have been posted and several guard dogs put on watch.

Does a "clear and present danger" exist? Not necessarily. The drums might not have anything toxic in them, or the owner might be storing toxic chemicals on the farm, but only temporarily and in a safe manner. Is no intervention justified? Shouldn't the new owner be required to offer an explanation?

In arguing against intervention based on utilitarian calculation, libertarian theorists have pointed to uncertainty, ignorance, and the subjectivity of knowledge. But they have not yet developed their own theory of justice to the point where it satisfactorily accounts for these important phenomena. The result has been sharp disagreement on many of the important issues of the day, such as nuclear power (Gofman and O'Connor 1980; *Inquiry* editors 1980) and aerial spraying of the pesticide, malathion (California Libertarian Party 1981; Gibson 1981).

To break the intellectual impasse on risk, appeal must be made to something deeper than the existing conception of rights, which brings us back to the concept of respect. Libertarian conceptions of rights are themselves shorthand notions for the respect owed to others. To say that someone has a property right to a particular entity is to prohibit others from interfering with that person's possession, use, or disposal of the entity.

Intervention Consonant With Respect

Potentially Mischievous Stores of Energy

Let us consider risk controversies over potential invasion first. Suppose in a suburban area that experiences occasional earthquakes, a real estate developer proposes to build a building without special earthquake engineering. A homeowner near the building site objects, arguing that the building could topple over during a quake, crushing his house and anyone inside. An independent civil engineer has estimated that the chances of this occurring are somewhere between 1 in 10,000 and 1 in 100,000 per year.

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The example raises in stark form the issue of when imposed risk should be prohibited and when it should be allowed. The limits will be determined on the basis of the normative principles for which I argued in the previous section. In summary, these are:

1. People should be respected in their persons in the sense that others should not impose "nontrivial" risks on them of serious bodily harm;
2. People should be respected in their pursuits and not forcibly restrained in their activities because of "trivial" risks that are not generally compelling;
3. The limits should be objective and impartial in the sense of depending on judgments about objective events and not on people's particular values or the details of their lives.

What limits satisfy the above criteria? The third criterion requires that the limits should be standard and uniform over time, that is, independent of anyone's particular age or health. The first two require the standard to be such that in living under it, people are very unlikely to be prematurely killed or incapacitated.

Suppose that the standard is such that people face chances of 1 in 100 to 1 in 1,000 of being seriously injured. Is this standard acceptable? Would it be sufficiently respecting of persons? I contend not.

On the other hand, suppose the likelihood of being injured by imposed risk during one's life was 1 in 100,000 or less. Would one be justified in demanding that others reduce the risks even further? I contend not. Relative to other concerns, the risk is much too trivial.

We are then left with the grey area — on the order of 1 in 10,000. To determine a uniform, *per annum* standard of risk from this grey area limit, we have to take into account the pattern of human life expectancy. Given the age distribution of human life expectancy, what amount of risk per year produces a total lifetime risk on the order of 1 in 100,000? The answer is approximately one in a million per year.

On this basis, the following standard has been developed for risks of seriously harmful invasions: If the risk is about 1 in 100,000 per year or more, it is enjoinable. It it is 1 in ten million or less, then no legal remedy is warranted. And finally, if the risk is one in a million, some compromise should be sought. This will be discussed further below.

Reconsidering the earthquake example, we find the imposed risk violates the standard by at least a factor of 10. Under the standard, therefore, the homeowner has the "right" to object to the construc-

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tion of the tall building unless it is engineered to reduce the risk.

As another example, suppose a homeowner objects to his neighbor's barbecue fires. His concern is that they might shoot off sparks and create a fire that would spread to his house and severely burn him. An independent fire insurance appraiser estimates the chances of this happening to be less than 1 in 100 million per year. In this case the risk is trivial, the homeowner's worry is unreasonable, and the standard does not provide a remedy.

Finally, suppose a businessman is concerned about a neighboring company that stores explosives in a shed not far from his office. An insurance appraiser judges the risk of a major explosion to be "somewhere around one in a million per year." This is a borderline case. In terms of the normative criteria presented above, the issue produces an intellectual stalemate. The businessman has some grounds for concern; the company, on the other hand, has some reason for annoyance. A compromise is in order. It is at this stage in resolving risk controversies that efficiency perhaps has a role to play. A compromise that is inefficient in terms of the conflicting parties' interests can hardly be justified as being reasonable. The appraiser, however, might point out that the risk could be greatly reduced if the explosives were stored in a reinforced concrete box costing only a few hundred dollars. A both efficient and fair way to resolve the controversy might be to require the company to purchase and use the box, with the businessman paying part of its cost. The solution would be efficient to the extent that it is the least costly way to reduce the risk to a nonobjectionable level. It would be fair since the entire cost of risk reduction should not be borne by the company alone.

There are many controversies in which borderline risks cannot be reduced to satisfactory levels except at great cost. In such cases, the most efficient and fair solution might be to require those creating the low levels of risk to pay a small amount of ex ante compensation to those who have to endure it. Bayesian decision theory might be employed in determining a justifiable amount. Since the risk is imposed, however, and not chosen, the ex ante compensation should not eliminate future liability.

It should be emphasized that in the position developed here, economic considerations play only a limited, second-order role.[3] Where they do enter, they do so in tandem with considerations of

[3]This is in contrast to the normative theory of law of Posner (1979), in which economic efficiency is central.

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fairness. The foremost principle is that of respect for persons and their activities.

Minute, Possibly Toxic Invasions

In taking up the other category of risk controversies, let us again begin with an example. A rural resident is concerned about a nearby nuclear facility that emits radiation. The exposure he receives is approximately 10 percent of that from natural sources (10 millirems in comparison with 100 received naturally). As a result of the additional radiation, his chances of getting cancer are estimated to increase by one in a million for each year of exposure (an estimate based on the findings of the National Academy of Sciences (BEIR 1980, p. 342)). Is this a borderline case?

Under the standard developed above for potential invasions, it would be, but should actual invasions be treated the same as potential ones? Intuitively, it seems that actual invasions should be subject to a stricter standard.

It might be argued that risks are equivalent so long as the overall likelihood of harm is the same, and so the same standard ought to apply. This overly narrow consequentialist view, however, ignores any sense of right not to be disturbed in one's own space. In short, it ignores consideration of respect.

Human life expectancy is a natural, objective reference point from which to gauge the significance of risk. The standard developed from this reference point should apply to actual as well as potential invasions. (Hereafter it shall be referred to as the primary imposed risk standard.) Actual invasions, however, involve an additional consideration: Not "significantly disturbing" another's environment. An additional standard therefore is needed, with an appropriate reference point, which can be provided by the total toxic risk from chemicals, organisms, and radiation found naturally in the environment. So long as the total risk from man-made invasion is comparatively small (and satisfies the primary standard), there would seem to be little if any grounds for complaint. But how little is "small in comparison"? I suggest on the order of one hundredth of the natural risk.

If this reasoning is accepted, we can deduce a quantitative standard for toxic invasions. We need only multiply an order of magnitude estimate of natural toxic risk by one hundredth. The problem, however, is that there is no published estimate of total, natural toxic risk; and while it is small, attempting to put together a defensible estimate from available sources is a major research task.

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Thus, determination of the quantitative standard cannot be completed here.

If, however, an invasion involves particles or substances found naturally in the environment, its insignificance can be demonstrated in a simpler and more straightforward manner: If the invading quantities are two or more orders of magnitude less than the natural quantities, then it follows that the risk associated with the invasion is less than one hundredth of the total natural toxic risk. Thus, meeting this "comparison of physical quantities" standard is sufficient to meet the more fundamental "comparison of risks" standard.

Going back to the radiation example, we find the facility must reduce its radiation emissions by a factor of 10 (down to one millirem of exposure per year), if the increase in toxicity of the rural resident's environment is to be insignificant under the "comparison of quantities" test. If we assume a linear relationship between radiation exposure and the risk of cancer, reducing the emissions by a factor of 10 reduces the annual incremental risk of cancer to the rural resident to approximately 1 in 10 million. Thus, reducing the emissions by a factor of 10 reduces the risk to a nonobjectionable level under the primary standard as well.

If natural radiation is the major natural source of toxic risk, then under the assumptions made so far, a standard on the order of one millirem per year of imposed radiation would be quite defensible. This compares with the original Federal Radiation Council guideline of approximately 170 millirems and a current U.S. Environmental Protection Agency standard of 25.[4]

But if the cancer risk from radiation is an order of magnitude higher than has been assumed, as some scientists contend (Gofman 1981, p. 314), then a one-millirem invasion would be borderline under the primary standard, although small in comparison with the exposure from natural sources. (As a point of interest, it has been estimated that the U.S. nuclear power industry exposes the general public to .03 millirems per year (BEIR 1972, p. 19), but this estimate is hotly disputed (Gofman 1981, p. 530).)

It has been assumed so far that the invading substance can be toxic at low levels. Another way to demonstrate insignificance, of course, would be to show that below certain concentrations, toxicity most likely ceases. This has not been demonstrated for radiation, but does appear to be the case for many of the more common

[4] *Code of Federal Regulations.* 40 CFR 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

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pollutants (carbon monoxide, sulfur dioxide, nitrogen oxides, and lead). Similarly, the concentrations of malathion used in the recent aerial sprayings in northern California against the Mediterranean fruit fly do not appear to be toxic (Marx 1981).

An Adjudicatory Framework

Questions

The discussion so far raises at least as many questions as it answers:

1. Should people have to respond to any charge of "excessive imposed risk"?
2. In proceedings to resolve risk controversies, who should have to argue what, and who should bear the costs?
3. What about risks associated with new technologies, with which there is little experience?
4. What about conflicting expert judgments about the likelihood of harm? Would judgments be so hard to predict that numerous controversies would break out, requiring considerable legal resources to resolve?
5. How would people respond to the incentives created by the adjudicatory system?

All these questions cannot be addressed here in detail; I will only offer some views.

A Normative View

Those concerned about imposed risk typically face major informational barriers in gauging it accurately. Specialized technical knowledge and on-site inspection may be required. Those involved with dangerous forms of energy owe it to others to provide credible evidence that the risk does not violate the standards developed above. If they do not provide such evidence, and, if on the basis of available information there is reason to believe they are in violation, then they should have to dispel the concern as a matter of law. Furthermore, they should have to bear all reasonable costs associated with the legal proceedings. (The reason is that in creating and failing to assuage a reasonable concern of harm, they have not sufficiently respected others.)

A Procedure and Its Incentives

This normative view could be implemented in a two-stage ad-

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judicatory procedure as follows: Prior to the initial hearing, the plaintiffs would have to contact the defendants who are creating the risk, giving them a chance to respond voluntarily. Assuming the plaintiffs are dissatisfied with the response, they could then make the case in a preliminary hearing that there are reasonable grounds for believing the standards have been or will be violated. The hearing would be presided over by a single "judge" with appropriate expertise, who would decide on the reasonableness of the plaintiffs' prima facie case. The judge would contact the defendants about the preliminary hearing, but it would be their decision whether or not to attend and represent themselves.

If the judge dismissed the plaintiffs' concern, they would have to pay the nominal costs of the preliminary hearing. (In this manner defendants would not be needlessly dragged into a hearing. In particular, the hearing fee would provide plaintiffs with an incentive to bring only reasonable concerns before the judge. Thus, the dice would be loaded against any right to protection against risk — but not to the point of injustice.)

If, on the other hand, the preliminary judgment was in favor of the plaintiffs, then a full-scale hearing would be initiated, and the burden of the argument would shift to the defendants. The defendants would have to pay for all the plaintiffs' reasonable costs for both hearings. This strict reimbursement principle would encourage lawyers, scientists, and engineers to form private concerns that would be on the lookout for excessive risks. They could recover their costs from reasonable legal fees for the plaintiffs they defend. The principle would also encourage would-be defendants to consider risks carefully and impartially beforehand and to commission reputable independent studies of novel risks to provide evidence of compliance and to keep themselves out of fullings. In order to enhance their credibility, would-be defendants could submit their activities to voluntary regulation by insurance companies, which in turn would represent them in the hearing process. Thus, risk oversight might become a *business* rather than a tax-supported activity. Finally, should someone find himself a defendant subject to a full-scale hearing, the strict reimbursement principle is an incentive to settle matters as quickly as possible — preferably before the hearing begins.

Once in a full-scale hearing, defendants and plaintiffs would make their case to an independent panel or "jury" with particular expertise in the risk at issue.[5] The panel would have to come to a consensus about which steps, if any, the defendants should take to

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reduce the risk. The fact that the standards require risk estimates with only order of magnitude precision should facilitate consensus; but should panel members cling to widely varying estimates that straddle the standard, a compromise remedy would have to be devised. The remedy should leave at least a majority of the panel of the opinion that the standards are not being violated outright. In fashioning the compromise, the panel should be able to seek additional information from both the plaintiffs and defendants so as to make it as fair and as least costly as possible. This is simply the best that human beings with very limited prescience can do.

The Role of Precedents

The judgments rendered in the hearing process would serve as precedents for judges and panels in the future. The precedents would be prima facie binding, overturnable on the basis of new information or experience about the risk in question. The precedents would provide planning guidelines to would-be defendants. Also, the body of precedents together with the reimbursement principle would deter unnecessary litigation, since it is not in plaintiffs' and defendants' interest to go through with a hearing when the outcome is reasonably clear.

New Technologies

Reasonable estimates of risk are likely to vary the most for radically new, potentially dangerous technologies. It may be in the interest of companies that want to develop such technologies to seek a prior, "declaratory" judgment on their safety before proceeding. Going up against a tough devil's advocate will put their planning to a rigorous test, and provide some legal assurance that their activities will not later be enjoined.

There are several steps that a company developing a new, hazardous technology can take to narrow the range of reasonable estimates and reduce the risk below the standards developed above. First, a company can submit a detailed analysis of the risky actions and what engineering steps it plans to take either to eliminate the risk or to reduce it to insignificance. Evidence at this stage of careful thinking and quality management may be sufficient to justify a low-risk estimate.

[5]The concept of legal bodies with special competence to render scientific and technological judgments is discussed in "The Scientific Court Experiment: An Interim Report." *Science* 193 (20 August 1976): 653-656.

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The second step could be to exploit any analogies between the proposed venture and past ones that were notably safe and well managed. A company can point to its own proven track record, to the positive experiences of other companies developing new technologies, and to any technological or managerial similarities between its own venture and notably safe ones. The company can then cite the reasons why its new venture will be at least as safe as the analogous ones (assuming the company is trying to improve upon the past).

The company can also purchase insurance, and if it receives a particularly good rating from an insurance firm with proven judgment, then this fact can be introduced as further evidence of a safely planned venture. The same insurance company perhaps could act in a regulatory capacity, as suggested earlier.

Finally, if the company wants to carry on some particularly hazardous activity and the other steps are not sufficient, the company can conduct the activity on a small scale at a remote location. After gaining experience and confidence, the company could expand the activity and move it closer to populated areas.

Conclusion: Common Law vs. Regulation

Whether a common-law approach to risk should replace the current regulatory approach is another issue that deserves book-length treatment. Since such a radical change in policy would have to overcome a great deal of scepticism, however, I want to make a few concluding points in defense of a common-law approach.

The Lack of Historical Support

Most scepticism stems from the fact that history has spoken almost uniformly against this idea: Risk has always been dealt with through regulation. Prior to the Industrial Revolution, except for urban fires and contagious disease, imposed risk was not much of a social concern. The technology did not exist to create major imposed risks, and people were faced with far more important matters of survival. During the Industrial Revolution, people began to consider the injustice of imposed risk. A legal vacuum existed, however, and the state-run, monopolistic, resource-constrained legal systems had no clear incentive to innovate or the ability to expand judicial services in order to address the problem. A more pressing task was to fashion a tort law that could deal with all the actual harms in a politically feasible way.[6] An excessive 19th cen-

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tury concern with objectivity may also have prevented the courts from dealing with the issue of risk.

Various well-publicized accidents helped to galvanize public opinion and put pressure on the legislatures to fill the vacuum left by the courts. The pressures were resisted by special interests who preferred the legal status quo, but eventually legislation was passed. The result, however, was a number of ad hoc policies born in back-room political compromises. Since the courts were inadequate to the task, regulatory bodies were set up with much stronger powers than the courts. Subjective questions of risk became subordinate to the whims of those running the agencies. The result is today's maze of unprincipled and often conflicting regulations — from those embodied in zoning codes to those of the Nuclear Regulatory Commission. While to some extent we have learned to live with risk regulation, it has not been without great cost, and few are happy with it.

Today's regulatory system may have been historically inevitable, but this does not imply that far more enlightened alternatives toward risk do not exist and could not be put into place should people change their traditional way of thinking.

The Impossible Transition

Sceptics would also wonder how the transition would occur. Let me offer only a couple of suggestions.

A system of courts specializing in risk could be set up or encouraged to develop. The courts would have the power to overturn past regulatory decisions or current standards after it could be satisfactorily argued that they were unnecessarily restrictive for keeping risks low. The courts would also have the power to deal with new imposed-risk issues and new precedents if the case could be made that existing law was inadequate.

Nonoptimal Enforcement

Sceptics might also worry about too much or too little enforcement in a privately enforced system of common law. Even if law firms defended people on a contingency fee basis, would all risk that should be stopped get stopped? For instance, would firms not want to take on cases with highly uncertain outcomes? What about situations in which the risk creator is insolvent and those at risk too

[6]For an account of the fashioning of American tort law in the first half of the 19th century, see Horwitz (1977).

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poor to hire a lawyer? On the other hand, would firms inefficiently duplicate each other's efforts in scouting out excessive risks? It is important to point out, however, that these are also problems encountered with the regulatory process.

In closing, let me switch from defensive to positive considerations.

1. Under the principle of "losers pay," the common-law system developed above would be self-financing, would not require tax funding, and could expand and contract, depending on the case load.

2. People would be able to initiate the hearing process at low cost; this system promises to be more responsive than a faceless regulatory agency.

3. The system could take on new risk problems as they arose, rather than letting a crisis build, as is often required for a legislative solution to be adopted.

4. In general, it would evolve a body of law from direct contact with the problems, rather than responding from a position of little experience and from "on high."

Most importantly, the common-law approach would move the resolution of risk controversies from a partisan political arena into the hands of impartial judges and panels. They would operate in a more open system and be required to explicitly justify their conclusions.

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COMMENT ON "IMPOSED RISK"

James L. Johnston

There are at least two grounds on which to commend Gerald Sauer's paper on imposed risk. One is the powerful criticism he offers of traditional regulation by government for handling (or should I say, mishandling) problems of externalities. The other is the courageous attempt to fashion a new judicial institution for settling disputes arising out of situations, like the typical pollution problem, where liability is not well defined.

The system proposed is a two-step process. The first is a kind of arbitration where participation by the "defendant" is voluntary. If the judgment at the first stage goes against the defendant, the system progresses to the second stage; otherwise the process is completed.

At the next stage a full-scale hearing is conducted and the burden of the argument shifts to the defendant. The decision is rendered by a panel, which also decides on the size of the damage award. In the first stage legal fees would be borne by the plaintiffs. Only if there were a successful judgment at first stage would the burden of the legal fees (for both stages) fall on the defendant.

Sauer correctly concludes that once decisions develop a pattern and become predictable for a set of cases, disputes will tend to be settled outside of the hearing process. The reason, of course, is that final decisions, when they can be anticipated, tend to dominate the earlier negotiations. However, that same argument can be used to question whether the first stage of the hearing process can use one set of rules for the burden of proof and legal fees and another set for the second stage. It would seem that rules at the second stage would dominate the first stage and the negotiations that might precede it. Thus, the intent of having a modest barrier at the first stage against nuisance suits is effectively defeated.

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Sauer expects that only problems with a nontrivial probability of occurrence will be brought to his dispute settlement machinery, or indeed to any mechanism or institution devoted to the definition and enforcement of property rights. That is only partially true. The missing consideration is the magnitude of the damage. Decisions sought will be those where the product of the probability of occurrence *and* the damage that would result is significantly greater than the ordinary ambient riskiness of going about one's life.

There is also a question about risk. Specifically, it is not a single-dimensioned attribute. For example, water quality for irrigation purposes is adversely affected to a serious extent when only traces of boron are present, yet the suitability of such water for human consumption is unaffected.

The foregoing are, of course, minor flaws. I do not mean to imply, however, that the paper will stand as a contribution if only a few repairs are made. There are some fundamental problems that cannot be so easily accommodated. One is that risk and damage are unknowable to any workable extent. Consequently, the system may not produce the appropriate damage awards. The implication of this is serious. Without an improvement in the definition and enforcement of property rights the allocation of resources will be further distorted. An even more serious problem is the fashioning of a complex legal institution in advance of fully understanding the problem of externalities and what free-market institutions already exist for accommodating them.

Gerald O'Driscoll makes the point eloquently in his comments on the Epstein paper elsewhere in this journal. Markets already address externalities where it is worth it to do so. So-called "failures" of the market are little more than examples that some economists present to their students to help the freshmen understand the rudiments of supply and demand. Only the least competent economists turn that exercise into a campaign to make the world conform to the "pure and perfect competition" model.

This is not to say that the market has already devised all the solutions and none remain. Before advocating a new institution, however, it would seem appropriate to take inventory of what free-market solutions have previously emerged in selected instances. It would also seem reasonable to quantify in a gross fashion the value of attempting to improve the property rights, so that the cost of any new institution could be weighed against it. What these two steps imply is that the market may have already worked out solutions to the serious problems, and the remaining cases may be too costly to

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solve with the present technology.

If one were to make a list of market solutions to externality problems, it might be rather long. The following is just a partial one, but still instructive: Law suits, injunctions, and arbitration; insurance; sales tied in with excludable goods; patents and copyrights; clubs; social ostracism; unitization of oil fields; fish farms; rentals of bees; hunting preserves; fishing licenses where the proceeds go for restocking; toll roads, vehicle registration fees, and motor fuel excises that can only be spent on roads; and cable-TV scramblers.

These all imply that competition and the potential gain from excluding free riders is sufficient in many areas. On the other hand, government institutions, including the new quasi-judicial ones that attempt to improve environmental quality, are not subject to the same discipline and are not forced to demonstrate that a positive net contribution results from their existence.

Indeed, there is reason to believe that government regulation to cope with environmental externalities may make the problem worse. It is to Sauer's credit that he offers a strong critique of regulators. To my mind, however, a couple of important aspects are omitted. First, vesting decision-making authority with regulators who bear neither the full rewards for successes nor the full liability for their mistakes actually creates a new externality without eliminating the old one.

In addition, there is seldom a systematic trade-off between the costs and benefits of regulation or standard, to say nothing of an attempt to identify spillover effects from the regulations. Perhaps the worst case is when regulations specify the particular abatement technology to be used, such as stack-gas scrubbers for coal-fired boilers. The effect here is to retard the development of more effective abatement technologies.

There may be ways to repair Sauer's proposal so that the political system does not turn his suggested solution into an additional problem. If there are, I am unaware of them. All this leads me to worry whether one can reasonably expect Sauer's legal machinery to actually produce an improvement. While I would hope for the best, I am prepared for the worst.

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RADIATION POLLUTION AND CANCER: COMPARATIVE RISKS AND PROOF

Bernard L. Cohen

Radiation

One of the most important physical phenomena in our universe is the existence of electromagnetic waves. They consist of electric and magnetic fields rapidly reversing in direction and propagating through space ("radiating") at a speed of 186,000 miles per second. The number of times per second the direction of the fields go through a cycle (i.e., reverse and then reverse again back to their original direction) is called the frequency, and it determines their behavior and the uses that can be made of them. Frequencies around 1 million cycles/sec are used for radio broadcasting; television uses about 100 million cycles/sec; radar and microwave ovens use about 10 billion cycles/sec; frequencies around 10 trillion cycles/sec are called "infrared"; our eyes sense frequencies of 400-750 trillion cycles/sec, so we call electromagnetic radiation in this range "light"; frequencies of a few quadrillion cycles/sec are called "ultraviolet"; frequencies above a quintillion cycles/sec are called "X-rays," and still higher frequencies are known as "gamma rays." A remarkable property of these radiations is that they occur in bursts, with each burst containing a definite amount of energy, which is proportional to the frequency. In many ways these bursts of radiation may be thought of as particles.

When one of these particles passes close to an atom, the electrons orbiting the atom feel the force of its rapidly oscillating electric field and are shaken back and forth by it. If there is enough energy in the particle of radiation, this shaking is strong enough to knock the electron loose from the atom. Only the highest frequency particles, X-rays and gamma rays, have enough energy to completely

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separate an electron from an atom.

Since the orbiting electrons are responsible for binding atoms together to form molecules, knocking an electron loose can destroy a molecule. For example, the water molecule is composed of atoms of hydrogen and oxygen, so an X-ray or gamma ray passing near it can break the molecule up into separate hydrogen and oxygen atoms. The very complex molecules that control biological activity of cells can similarly be broken up or otherwise altered when struck by radiation, and it is because of this property that radiation can cause cancer, which is an uncontrolled growth of cells.

In addition to X-rays and gamma rays, "nuclear radiation" includes other particles emitted from nuclei, like electrons, protons, neutrons, and alpha particles. When an atomic nucleus undergoes a transformation, these particles (as well as X-rays and gamma rays) often come shooting out with velocities in the neighborhood of 100,000 miles per second. Since they have an electric charge (or can transfer their energy to other particles that have an electric charge), they will exert electrical forces on the orbiting electrons of the neighboring molecules they pass. Consequently, the electrons of some of these molecules *may* be jarred loose and destroy, or alter, the molecule. This paper will examine the importance of nuclear radiation as a cause of cancer.

How Dangerous Is Radiation?

Although radiation appears very dangerous, we should remember that individuals are struck by about a million particles of radiation every minute from natural sources. One third of this radiation comes from outer space, another third comes from radioactive materials like uranium, thorium, and potassium, which are found in the ground and in materials we derive from the ground; the remainder comes from radioactive materials in our bodies, especially potassium, a substantial quantity of which is vital to life. In addition to these sources of radiation, which affect all our organs, radon gas (a derivative of uranium) exposes our bronchial regions to radiation from the very air we breathe.

Natural radiation is not insignificant. It is hundreds of times larger than the well-publicized radiation exposure from the nuclear industry. However, natural radiation exposure varies considerably with geography and other factors. In Colorado, where the high altitude reduces the thickness of air that shields us from radiation coming from outer space and where the amount of uranium and thorium in the ground is abnormally large, the average exposure from natural sources is more than 50 percent larger than the na-

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tional average; in Florida, it is 20 percent below average. Choice of building materials can have a substantial effect on radiation exposure. Living in a brick or stone house typically results in 20 percent higher exposure than living in a wood house, and some particular building materials, like the granite used in New York's Grand Central Station and in the congressional office buildings, can more than double a resident's exposure. Finally, in some houses radon levels are 10 or even 100 times higher than outdoor levels, because air leakage has been reduced.

Besides natural radiation, to which mankind has always been exposed, there is an important new source of radiation introduced this century: medical X-rays. A typical X-ray exposes us to 100 billion particles of radiation, or about one fourth as much radiation exposure as the average American receives annually from natural sources. This is hundreds of times more radiation than we can ever expect to receive from the nuclear industry. There are many techniques for reducing radiation exposure in X-rays without compromising their medical usefulness. Moreover, many X-rays are not made for medical purposes, but to protect hospitals and physicians against libel suits. Thus, a change in the legal structure could help us avoid unnecessary medical X-rays.

If we are all being struck by a million particles of radiation every minute, why don't we all develop cancer at an early age? The reason we don't is *not* because this level of radiation is "safe." Even a single particle of radiation can cause cancer, but the probability for it to do so is very small, about one chance in 30 quadrillion (i.e., 30 million billion). Hence, the million particles that strike us each minute have only one chance in 30 billion of causing a cancer. A human lifespan is about 30 million minutes; thus, all of the natural radiation to which we are exposed has one chance in 1000 (30 million/30 billion) of causing a cancer. Statistics show that our overall chance of dying from cancer is one in five, so only one in 200 of all cancers may be due to natural radiation.

The average exposure from a nuclear power plant to those who live closest to it is about one percent of their exposure to natural radiation; hence, if they live there for a lifetime, there is one chance in 100,000 that they will die of cancer as a result of exposure to radiation from the nuclear plant.

Scientific Basis for Risk Estimates

How do we know these risks so quantitatively? Few fields of science have been investigated as thoroughly as the health effects of

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radiation. The U.S. government has spent over $2 billion on this research since World War II, which has helped to produce over 40,000 scientific papers. Radiation measuring techniques are well developed, highly accurate, extremely sensitive, and relatively cheap. Even student laboratories have instruments capable of detecting radiation levels millions of times lower than those normally associated with harm to health. By contrast, many air pollutants are quite difficult to measure even at 10 percent of harmful levels.

Several prestigious scientific groups, notably the U.S. National Academy of Sciences Committee on Biological Effects of Ionizing[1] Radiation (BEIR), the United Nations Scientific Committee on Effects of Atomic Radiation (UNSCEAR), the International Commission on Radiological Protection (ICRP), and the U.S. National Council on Radiation Protection and Measurements (NCRP), provide frequent summaries and evaluations of available data and recommend future research directions. In the last four years, BEIR (1980), UNSCEAR (1977), and ICRP (1977) have issued reports assessing the cancer risk from low-level radiation. We shall now review their methodology.

Radiation doses are expressed in *millirem* (mr), with each mr roughly equivalent to 5 billion particles of radiation. The average dose from natural radiation is about 100 mr per year, and medical X-rays give the average American an additional 40 mr per year. The above-mentioned studies by BEIR, UNSCEAR, and ICRP estimated that there should be one extra cancer for every 8-million mr of exposure to humans; or equivalently, every mr of exposure produces a one-in-8-million chance of developing a fatal cancer.

The health effects of high-level radiation are rather well known. Among the survivors of the atomic bomb attacks in Japan, there were 24,000 people who received an average exposure of 130,000 mr; about 120 extra cancers developed among them up to 1974. There were 15,000 British patients treated with X-rays for ankylosing spondylitis (arthritis of the spine) with doses averaging 370,000 mr; they had about 115 extra cancers. More than 900 Germans were treated for that same disease and for bone tuberculosis with injections of radium to the bone averaging 4.4 million mr; 45 developed bone cancer (with 0.1 expected). About 1,700 American women employed during the 1920s painting radium on clock and watch dial numerals used their tongues to put a fine tip on the

[1] "Ionizing" means knocking electrons loose from atoms.

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brush, thereby allowing radium to enter their bodies; their average bone dose was 17 million mr, and 48 of them died of bone cancer (with 0.4 expected). Among 4,100 U.S. uranium miners exposed to excess levels of radon gas due to poor mine ventilation, the average exposure to bronchial surfaces was 4.7 million mr, and up to 1972 there were 135 lung cancer deaths among them (with 16 expected). There have been several other miner groups that have experienced excess lung cancers, such as the group of 800 Canadian fluorspar miners whose average bronchial exposure was 2.8 million mr, resulting in 51 lung cancer deaths (with 2.8 expected). Finally, there have been a number of situations where high exposures have resulted in approximately 10 extra cancers: Women in a Nova Scotia tuberculosis sanitarium exposed to excessive X-rays in the course of fluoroscopic examinations; U.S. women treated with X-rays for inflammation of the breasts following childbirth; various types of pelvic X-ray treatments; children treated with X-rays for enlargement of the thymus gland; patients in several countries fed a thorium compound to aid in X-ray contrast studies; and Marshall Islands natives exposed to fallout from a nuclear bomb test.

If one wants to find similar information on low-level radiation, however, the statistics are limited. For example, suppose one found a group of 10,000 white males who had received an extra 10,000 mr of whole-body radiation. The easiest evidence to find would be excess leukemias because that disease develops earliest and is among the most sensitive to radiation. As a first approximation, we might use the results of high-level radiation studies, which show that leukemias are induced at a rate of about 1.0×10^{-9}/yr per mr of exposure. We would then expect $(10{,}000 \times 10{,}000 \times 10^{-9} =) 0.1$ *extra* leukemias per year among this group. In the absence of radiation, one would expect 0.88 leukemias if we take statistics for the entire U.S. In the 25 years over which radiation is effective in causing leukemias, we then expect 22 ± 4.7[2] cases from natural causes versus 2.5 from the 10,000 mr radiation exposures. Obviously, the statistics here are marginal at best. However, the problem goes much deeper, since the total U.S. population is not a suitable control group. Cancer is largely caused by environmental factors and hence is subject to wide variations in incidence rates. For instance, the 0.88 leukemias expected for the U.S. in the absence of radiation varies from 1.0 in MN and DC to 0.77 in ME and NM. This could

[2]The $\pm$ indicates the range of variations expected due to statistical fluctuations. If studies were made on a large number of groups, two thirds of the results should lie between $(22 - 4.7 =)$ 17.3 and $(2.2 + 4.7 =)$ 26.7.

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vary the number of expected cases from 19 to 25, making it still more difficult to ascertain that there are two or three extra. Moreover, a group of people with 10,000 mr of extra radiation would typically have more environmental factors in common than merely living in the same state.

Therefore, any experimental study of effects of low-level radiation would need large populations and there would be considerable difficulty in selecting a control group. One way to achieve large numbers of subjects would be to use variations in natural radiation. For example, we could select citizens of Colorado, Wyoming, and New Mexico, who are exposed to about 5,000 mr more than the U.S. average over their lifetimes. However, the leukemia rates in these states are considerably *below* the U.S. average: 8.11 versus 8.81×10^{-5}/year for white males and 5.13 versus 5.74 for white females. The same is true for all cancers. The high natural radiation states have annual rates of 140×10^{-5} for white males and 114×10^{-5} for white females, while the U.S. average is 174 and 130 respectively. The fact that states with high natural radiation have considerably lower cancer rates than average is generally dismissed as indicating only that radiation is very far from being the principal cause of cancer. This point is logically correct. Nevertheless, this author is highly skeptical about whether that attitude would be accepted if states with high natural radiation happened to have somewhat higher than average cancer rates.

Since there is little direct evidence on effects of low-level radiation, the simplest option is to obtain estimates from our abundant data on effects of high-level radiation, by assuming a linear dose-effect relationship. For example, if high-level dose D causes a cancer risk R, we assume that a dose 0.1 D will cause a risk 0.1 R, and so on down to extremely low doses.

This linear dose-effect relationship is nearly always used, with relatively minor variations, to estimate effects of low-level radiation. Moreover, when its use is recommended by the above-mentioned groups, it is accompanied by a statement that this is more likely to overestimate than to underestimate the effects of low-level radiation. There is a considerable variation in opinion about how much any overestimate is likely to be. On the one hand, a sizable number of experts claim that the overestimate is gross, say by a factor of 2-10, while an equally important body of opinion says that linearity does not give an overestimate. We now turn to the evidence behind these positions.[3] It comes from various sources.

[3] See Cohen (1980).

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Repair Processes

There is a great deal of evidence that nature provides mechanisms for repair of radiation damage to biological molecules. For example, a given dose of radiation is generally much less carcinogenic when spread out in time than when received all at once; this implies that damage from earlier doses was repaired before the later doses were administered. There is also direct microscopic observation of repair to chromosomes. From this we surmise that effects of low doses should be largely repaired, whereas repair of the much more extensive damage from high doses would be far less complete. This implies that the linear hypothesis overestimates effects of low-level radiation.

Mechanism for Radiation Induction of Cancer

One of the strongest reasons for believing that the linear hypothesis overstates the effects of low-level radiation derives from our understanding of how radiation induces cancer. While there are many gaps and uncertainties in our information, the general outline is strongly supported by experimental data and is widely accepted. If this understanding is correct, a linear dose-effect relationship overestimates low-dose effects in most cases, and never underestimates these effects.

Animal Data

The large body of data on radiation-induced cancer in animals, down to the 10,000 mr dose range, clearly indicates that the linear extrapolation from high doses overestimates effects at low doses.

Leukemia Among A-Bomb Survivors

Of all types of cancer, only leukemia data from the Japanese A-bomb survivors is sufficient to draw conclusions on low-dose behavior. For the lowest exposure categories, 10,000 mr — 50,000 mr, and 50,000 mr — 100,000 mr, there are definitely fewer cases than would be expected from a linear extrapolation from higher-dose data.

Bone Cancer Among Radium Dial Painters

Among the American women who ingested radium in painting radium on watch dials, there were fewer cases in the low-dose category then would be expected from a linear extrapolation from higher-dose data. The probability that this deficiency is due to statistical fluctuation is quite small, only a few percent.

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Environmental Radon Exposure

If the data on lung cancer among miners exposed to radon gas are extrapolated linearly to the doses received by the general population from environmental radon, they predict higher rates of lung cancer among non-cigarette smokers than are actually observed. Moreover, 50 percent of the extra lung cancers among the miners were of one particular type (small cell undifferentiated), whereas only 5 percent of lung cancers among nonsmokers are of this type. When allowance is made for other causes of lung cancer among nonsmokers, the discrepancy is even larger. This is strong evidence that a linear dose-effect relationship overestimates effects at low doses.

Latent Period Increase with Decreasing Dose

The time delay between exposure to radiation and development of the resulting cancer, called the "latent period," seems to increase as doses decrease. There is evidence for this among the radium dial painters and in several animal studies. For example, beagle dogs whose bones were exposed to 100 million mr developed bone cancer in an average of two to three years, whereas those exposed to 5 million mr developed bone cancer only after about 10 years, which is nearly a full life expectancy. From this trend, we would expect cancer from low doses not to develop until long after the would-be victim has died from other causes. If this is true, low-level radiation becomes essentially harmless.

The best-known claim that linear extrapolation underestimates the effects of low-level radiation is a paper by T.F. Mancuso, A. Stewart, and G. Kneale (1977). The studies by T. Najarian and T. Colton (1978), and by I.D.J. Bross, M. Ball, and F. Falen (1979), reach a similar conclusion. All of these studies, however, have drawn heavy rebuttals in the scientific literature, and have been rejected by the prestigious committees charged with responsibility in this area.[4]

Radiation From the Nuclear Energy Industry

We now turn to sources of radiation from the nuclear energy industry. The three that have received the most public attention are routine emissions of radioactivity from nuclear plants, reactor meltdown accidents, and high-level radioactive waste.

[4] See Cohen (1980).

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Routine Emissions

When a nuclear power plant is operating normally, there are small quantities of radioactive gases and contaminants in water routinely released into the environment. More importantly, when the reactor fuel is chemically reprocessed, more radioactive gases are released at the reprocessing plant.

These routine releases have been studied in extensive detail (UNSCEAR 1977) and great effort and expense have been applied to keep them as small as possible. Currently, the average American receives a radiation exposure less than 0.05 mr per year from these releases, but if all of our electricity were derived from nuclear power, the average exposure would be about 0.2 mr per year. If this is multiplied by the U.S. population (2.3×10^8 people) and the cancer risk ($1/8 \times 10^6$), we find that this might cause about six extra cancers each year in the United States, or about 0.02 for each year of operation of a large power plant.[5] Some of the radioactive gases released drift around the world exposing people in other countries. This raises the fatality toll to 0.1/plant-year over the next 500 years. If we add up effects into the infinite future, the result is 0.3 eventual fatalities per plant-year. These numbers are far below typical estimates of effects of air pollution from coal burning, which are about 20 fatalities per plant-year.

Reactor Meltdown Accidents

Perhaps the most publicized source of release is in the reactor meltdown accident, which has the potential for releasing large quantities of radioactive dust into the environment. Since there has never been such an accident, there is a substantial degree of uncertainty as to its expected frequency and health impacts. Therefore, we give two estimates of these, one by a large study group sponsored by the U.S. Nuclear Regulatory Commission (1975), and the other by the Union of Concerned Scientists (1977), the most prominent antinuclear activist organization.

For the frequency of reactor meltdowns, NRC estimates one per 20,000 plant-years, whereas the UCS estimate is one per 2,000 plant-years. After 1,000 plant-years of commercial operation around the world and over 2,000 equivalent plant-years of naval reactor operation, all without a meltdown, the UCS estimate implies that we are lucky we haven't had one yet. Moreover, a

[5] We take a large power plant to be 1 million kilowatts, which is capable of powering a city of about 750,000, and refer to the effects of one year of its operation as effects/plant-year.

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necessary precursor of a meltdown is a loss of coolant accident (LOCA), with only a very small fraction of LOCAs expected to result in meltdown. There has been only a single LOCA to date (Three Mile Island). This fact would seem to make the UCS estimate overly pessimistic.

There is a widespread misunderstanding of the consequences of a meltdown. We often hear that it would kill tens of thousands of people and contaminate a whole state, but such statements are grossly misleading. As a protection for the public in the event of a meltdown, reactors are enclosed in a very powerfully built "containment" building, which would ordinarily contain the radioactive dust inside long enough (about one day) to clean it out of the air. For example, investigators of the Three Mile Island accident all agree that even if there had been a meltdown, there would have been little harm to the public, because there is no reason to believe that the integrity of the containment would have been compromised. In most meltdowns, *no* fatalities are expected.

There are events that could break open the containment, releasing radioactive dust into the environment, and if this happens, the consequences depend on the timing and on weather conditions. In the most unfavorable conditions with a large containment break early in the accident, NRC estimates 48,000 fatalities, but this unusual combination is expected only once in 100,000 meltdowns.

According to NRC, the average number of fatalities in a reactor meltdown is 400; according to UCS, it is 5,000. A median estimate of the fatality rate due to air pollution from coal-burning power plants is about 5,000 each year. For reactor meltdowns to be as harmful as coal-burning power plants, we would need a meltdown every month according to NRC, or once each year according to UCS. We have ample evidence that meltdowns will not occur that frequently.

When the frequency and consequence estimates are combined, NRC concludes that we may expect an average of 0.02 fatalities per plant-year; UCS predicts 2.4. Note that even the latter figure given by the leading antinuclear activist organization is still far less than the 20 fatalities per plant-year due to air pollution from coal-burning electricity generation.

Of course these fatalities from air pollution are not detectable in the U.S. population in which 2 million people die every year. But the same is true of 98 percent of the fatalities from reactor meltdown accidents. For example, in the worst such accident, according to NRC, there would be 45,000 extra cancer deaths in a population

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of 10 million over 50 years. For each of these 10 million, the risk of dying from cancer would be increased from the normal risk of 17 percent to 17.5 percent. The present risk in different states varies between 14 percent and 20 percent, so the cancer risk in moving from one state to another is often many times larger than the risk from being involved in the worst nuclear accident.

Detectable fatalities occurring shortly after the accident and clearly attributable to it are rather rare. According to NRC, 98 percent of all meltdowns would cause no detectable fatalities, the average number for all meltdowns is 10, and the worst meltdown (a one in 100,000 occurrence) would cause 3,500. The largest coal-related incident to date was an air pollution episode in London in 1952 that caused 3,500 fatalities within a few days. Thus, as far as detectable fatalities are concerned, the worst nuclear accident (expected only once in 100,000 meltdowns) has already been equalled by coal burning.

The extent of land contamination in a reactor meltdown accident depends on one's definition of "contamination." The whole earth can be said to be contaminated because there is naturally occurring radioactivity everywhere. Many areas like Colorado can be considered contaminated because they have larger than normal natural radiation levels.

But if we use the internationally accepted definition of the level of contamination that calls for remedial action, the worst meltdown (one in 10,000 according to NRC) would contaminate an area equal to a circle of 30-mile radius. About 90 percent of this could be easily decontaminated by use of fire hoses and plowing open fields, so the area where relocation of people is necessary would be equal to that of a 10-mile radius circle.

Forced relocation of people is not an unusual circumstance. It occurs in building dams where large areas are permanently flooded, in highway construction, in urban redevelopment, etc. In such situations, the major consideration is the cost of relocating the people. Therefore, it seems reasonable to consider land contamination by a nuclear accident on the basis of its monetary cost.

According to NRC, the cost in the worst 0.01 percent of accidents can exceed $15 billion, but the average cost for all meltdowns is $100 million. Air pollution from coal burning also does property damage by soiling clothing, disintegrating building materials, inhibiting plant growth, etc. Estimates of the annual costs of this damage are in the range of $10 billion per year. At an average of $100 million per meltdown, we would need a reactor meltdown

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every four days to be as costly as the property damage from coal burning.

High-Level Radioactive Waste[6]

When the fuel from a nuclear reactor has been mostly burned up, it is removed from the reactor. Currently, the plan is to ship it to a reprocessing plant where it would be put through chemical procedures to remove the valuable components. The residual material that contains nearly all of the radioactivity produced in the reactor is called high-level waste. Concern has been raised about its disposal.

One important aspect of the high-level waste disposal question is the quantities involved: The waste generated by one large nuclear power plant in one year is about six cubic yards. This waste is 2 million times smaller by weight and billions of times smaller by volume than wastes from a coal-burning plant. The electricity generated by a nuclear plant in a year sells for more than $200 million, so if only one percent of the sales price were diverted to waste disposal, $2 million might be spent to bury this waste. Obviously, some very elaborate protective measures can be afforded.

Once the radioactive waste is buried, the principal concern is that it will be contacted by ground water, dissolved into solution, and moved with the ground water to the surface where it can get into food and drinking water supplies. How dangerous is this material to eat or drink? To explain this, we will take the quantity that would have to be ingested to give a person a 50-percent chance of fatality. When the waste is first buried, it is highly toxic and a fatal dose is only 0.01 ounce. However, the radioactivity decays with time, so that after 600 years, a fatal dose is about one ounce, making it no more toxic than some things kept in homes. After 10,000 years, a lethal dose is 10 ounces.

When some people hear that nuclear waste must be carefully isolated for a few hundred years, they react with alarm. They point out that very few manmade structures and few of our political, economic, and social institutions can be expected to last for hundreds of years. Such worries stem from our experience on the surface of the earth, where most things are short-lived. However, 2,000 feet below the surface the environment is quite different. Things remain essentially unchanged for millions of years.

The natural radioactivity in the ground is a good comparison. The ground is full of naturally radioactive materials so that by adding

[6]This section draws on Cohen (1977 and 1982a).

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nuclear waste to it the total radioactivity in the top 2,000 feet of U.S. soil would increase by only one part per million per plant-year. Moreover, the radioactivity in the ground (except that very near the surface) does virtually no harm — it can be shown that it causes less than one fatality every 10 years in the United States. Therefore, adding to it by one part in a million would not be a serious problem.

Waste burial plans would delay the release of the waste to the environment for a very long time, thus giving near-perfect protection from the short-term problem. Under these plans, the rock formation chosen for burial will be well-isolated from ground water and be expected to remain isolated for a very long time. Also, if water did enter that rock formation, it would have to dissolve a reasonable fraction of the surrounding rock before reaching the waste. The least favorable situation for this factor would be if the waste were buried in a salt formation, because salt is readily dissolved in water. However, in the New Mexico area being considered for an experimental repository, if all the water now flowing through the ground were diverted through the salt formation, the quantities of salt are so vast and the amount of water so meager that it would take 100,000 years to dissolve the salt around the buried waste.

A third protection is the special backfill material surrounding the waste package. Clays selected for this purpose swell up to seal very tightly when wet, thereby keeping out any appreciable amount of water. These materials are also highly efficient filters; if ground water did get to the waste and dissolve some of it, these clays would filter the radioactive material out of solution before it could escape with the water.

Another safeguard is that the waste will be sealed in a corrosion-resistant casing. Casing materials are available that would not be dissolved even if soaked in ground water for a million years. Also, the waste itself will be a rock-like material that would require thousands of years of soaking in water before dissolving. Ground water is more like a "dampness" than a "soaking," thus dissolving things hundreds of times more slowly.

There is also a time delay. Ground water moves quite slowly, usually only inches per day, and ordinarily must travel many miles before reaching the surface from 2,000 feet underground. Hence, even if the dissolved radioactive material moved with the ground water, it would take about 1,000 years to reach the surface. Yet, there are processes by which the rock constantly filters the radioactive materials out of the ground water, causing it to migrate about

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a thousand times slower than the water itself. It would therefore take most of the radioactive materials a million years to reach the surface even if they were already dissolved in ground water. Most of the radioactive materials are highly insoluble under most geological conditions; thus, if they were in solution when the water encountered these conditions (chemically reducing, alkaline), they would precipitate out and form new rock material.

Finally, if radioactivity did reach surface waters, it would be detected easily — one millionth of the amounts that can be harmful are readily detected — and measures could be taken to prevent it from getting into drinking water or food.

With all these safeguards, it seems almost impossible for much harm to result during the first few hundred years while the waste is highly toxic, and there is substantial protection over the long term.

One way of estimating the distant effects is to assume that an atom of buried waste has the same chance of escaping and of getting into a person as an atom of average rock. Average rock material *submerged in flowing ground water* has less than a one in 100 million chance per year of escaping into surface waters. Moreover, once in surface waters, its chances of getting into a human body are about one in 10,000. If these probabilities are applied to buried radioactive waste, it would eventually cause .017 fatalities per plant-year over the next 15 million years. Note that this is still 1,000 times less than the health effects of air pollution from coal burning.

If there is a problem in the above arguments, it would be how buried radioactive waste differs from average rock. There are basically two differences: First, a shaft must be dug to bury the waste, giving a connection to the surface not usually present for rock; secondly, the radioactive waste emits heat, which is not a normal property of rock. Solving the first problem depends on our ability to seal the shaft, and the technical community seems highly confident that this can be done to make the area as secure as if the shaft had never been dug.

The heat radiated from buried waste is enough to raise the temperature of the surrounding rock by about 200 degrees Fahrenheit. There has been concern that this might crack the rock, producing new pathways by which ground water can reach the buried waste and through which the dissolved waste might escape. This problem has been studied intensively for over a decade, and the conclusion seems to be that there are no serious problems of this type. These studies are continuing, however.

If it is decided that the temperature must not be allowed to rise so

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high, there are two easy remedies: The waste can be distributed over a wider area to dilute the heating effect, or burial can be delayed to allow some of the radioactivity to decay. The latter option is especially effective since the rate of heat emission is decreased tenfold after 100 years and 100-fold after 200 years. Also, the protective casings in which the waste will be enclosed is highly resistant to high-temperature ground water.

Since we have mentioned the ways in which buried waste is less secure than most rock, the ways in which it is more secure should be pointed out. The geological environment for the waste will be carefully selected and will be much more favorable than for average rock. The waste will be buried in a region with little or no ground water, whereas our average rock is submerged in ground water. Finally, the buried waste will be sealed in a leach-resistant casing that provides a complete and independent safety system which should avert danger even if all other protections fail.

Since most of the health impact of radioactive waste is expected to occur millions of years in the future, it is instructive to compare this with the carcinogenic solid wastes released in coal burning.[7] Some of these, like arsenic and cadmium, are very long lasting and can therefore be calculated in the same way as for radioactive wastes. When this is done, they can be expected to cause hundreds of eventual fatalities per plant-year, over 10,000 times larger than the effects of nuclear waste. Also, solar electricity technologies require vast amounts of materials, and deriving these requires the burning of large quantities of coal — about 3 percent as much coal as would be used to produce the same amount of energy by direct coal burning. Consequently, the wastes from solar technologies are at least 300 times more harmful (.03 × 10,000) than nuclear waste. In addition, some solar technologies use large quantities of arsenic or cadmium, which increases the health consequences considerably.

Radon Problems[8]

There is one other aspect of nuclear power that involves important health impacts, namely the release of radon. As mentioned earlier, radon is a radioactive gas that naturally evolves from uranium. There has been some concern over increased releases of radon due to uranium mining and milling operations, but these problems have now been essentially eliminated. Nuclear power is

[7] See Cohen (1982b).
[8] This section draws from Cohen (1981).

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important to the radon problem in that by mining uranium out of the ground, we avert future radon emissions and thus avoid future health impacts. Most of the uranium is mined from deep underground, so one might think the radon could not escape. However, the ground is constantly eroding away, so eventually the uranium that is mined would have come to the surface where its radon emissions could cause lung cancers. When these effects are calculated, the result is an eventual saving of 500 lives per plant-year of operation. This savings is thousands of times larger than the lives calculated to be lost from radioactive waste.

The influence of coal burning on the radon problem is not inconsequential. Coal contains small amounts of uranium which are released into the environment when coal is burned. Calculations of this effect indicate that coal-burning electric power production will eventually cause 30 fatalities per plant-year through its radon releases.

Risks From the Nuclear Industry in Perspective

For purposes of comparison we have discussed risks from producing equivalent energy by coal burning. These are summarized in Table 1.

TABLE 1

COMPARABLE RISKS OF FATALITIES FROM NUCLEAR RADIATION AND COAL BURNING*

Source	Fatalities per Plant-Year	
	Next 50 yrs	After 50 yrs
Nuclear — routine operation	.1	.2
Nuclear — accidents	.02(2.4)	0
Nuclear — waste	0	.017
Nuclear — radon	0	-500
Coal — air pollution	20	0
Coal — solid waste	0	100
Coal — radon	0	30

*For accidents, the table gives the NRC estimate, with the UCS estimate in parentheses. The minus sign corresponds to lives saved.

Radiation can cause genetic defects in later generations. The total number of such defects (the majority of which are nonfatal illnesses) is similar to the numbers of fatalities listed in Table 1. The

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number of nonfatal illnesses caused by coal burning is thousands of times larger than the number of fatalities.

Our discussion puts nuclear risks into perspective with risks from coal burning. However, it is also instructive to put these risks into perspective with other familiar risks. This has been done in terms of loss-of-life expectancy (Cohen and Lee 1979), with the following results.[9] If the U.S. depended solely on nuclear energy for its electricity, this would be as dangerous as: Smoking one cigarette every 10 years (10 weeks); increasing your weight (if you are at least 10 percent overweight) by 0.03 ounces (1.5 ounces); crossing a street one extra time every 20 weeks (three days); increasing the national speed limit from 55 miles per hour to 55.02 (56).

Alternative Sources of Electricity[10]

While 20 percent of the public believes nuclear energy is safer than coal, they would probably all agree that there are two alternatives much safer than either of these — solar energy and conservation. But this conflicts with careful analysis.

Let's start with conservation: How can conserving energy be dangerous? One example is that sealing houses more tightly to reduce heat leaks may increase the radon level enough to cause several thousand extra fatalities per year, if all American homeowners followed this practice.

More important is the relationship between energy use and wealth. There is a very strong correlation between the two among countries, at various times. Modern production technologies require a lot of energy; it is frequently said that the historically high level of U.S. industrial production was due largely to plentiful cheap energy. Energy brings wealth, and employment of wealth uses energy.

How does wealth relate to health? In the United States, well-to-do people live about four years longer than poor people. Death rates from diseases like tuberculosis, influenza, and pneumonia, and from accidents and suicide, are several times higher among the poor, and they are at least 10-30 percent higher from nearly every disease. Life expectancy in poor nations is typically 20 years less than in rich nations; it would be difficult to defend a position that the differences are racial, since American blacks live 20 years

[9] The first figure in each case refers to the NRC accident risk estimate and the second (in parentheses) to the UCS estimate.
[10] This section draws from Cohen and Lee (1979) and Cohen (1982b).

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longer than African blacks and Japanese live 11 years longer than other East Asians. Clearly, wealth adds years to life expectancy.

In contrast, the loss-of-life expectancy due to radiation if all U.S. electricity were nuclear is only about one hour if the NRC estimate on accidents is accepted, and still only two days if we accept the UCS estimate. Even with the latter, the effect of poverty is hundreds of times worse than the danger of using nuclear power. Therefore, if conserving energy reduces wealth, the ultimate health risks in conservation can be extremely large. This reasoning also applies to solar energy, which is expected to cost five times more than nuclear electricity.

There are also important pollution effects of solar energy on health. Producing the vast quantities of materials (steel, cement, glass) for solar systems requires burning a lot of coal, about 3 percent as much as would be used in producing the same energy by direct coal burning. Therefore, the fatality rates must be at least 3 percent of those listed in Table 1 for coal, which makes them larger than the rates for nuclear energy.

The Role of the Media

We conclude that nuclear energy is much safer than coal burning and safer than any alternative. This is certainly not the common understanding of the public. What is the reason for this discrepancy?

The public gets most of its information from the news media, so if the public is misinformed, the media must be held responsible. There is a serious problem here: The media, especially television, are primarily in the entertainment business. With a one-point increase in the Nielsen rating for network evening news worth $7 million per year in advertising revenue, every effort must be made to attract and maintain the interest of the audience. Stories about dangers of radiation excite the public and are therefore given wide coverage. Actually, there has not been a single fatal accident involving radiation for over 15 years, whereas there have been 2 million fatalities from other types of accidents in this country during this time period. Clearly, the media attention given radiation is far out of proportion to its actual dangers. As a result, the public has been instilled with a fear of radiation completely out of proportion with reality.

Members of the media generally do not read the scientific literature. Their contact with science is often through a handful of

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publicity-seeking scientists who tell them what they want to hear. Any scientist who reports the slightest evidence that makes radiation seem dangerous gets tremendous coverage, while contrary evidence is mostly ignored. As a result, we often hear reports that recent evidence indicates that radiation is more dangerous than it was believed to be 5 or 10 years ago, although there is no such accepted opinion in the scientific community.

The price we are paying for this breakdown in communication between competent scientists and the public is enormous. Not only is nuclear energy much safer than coal, it is also cheaper. There is solid evidence of this from plants that are now operating, and at least 95 percent of the economic analyses by people in that business — utilities (including publicly owned, non-profit utilities), banks that lend them money, and the economists whom they hire — conclude that this will remain true.[11] Nevertheless, as a result of the public misconception, all new power plants ordered for the past several years have been coal-burners. Every time a coal-burning plant is built instead of a nuclear plant, many hundreds of people are condemned to premature death, and hundreds of millions of dollars of public money is wasted. This is the price we are paying for failing to look at the facts.

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[11]Charles Komanoff, an economist who reached the opposite conclusion, was hired by antinuclear activists and has received a disproportionately large amount of publicity.

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A COMMENT ON COHEN

Lynn R. Anspaugh

Dr. Cohen, in this and related papers,[1] has made a strong case for nuclear power. This case is based upon his analysis of the human health risks associated with nuclear radiation compared with burning coal. I particularly compliment Dr. Cohen on his attempts to deal with the entire nuclear fuel cycle from the mining of uranium through the disposal of radioactive waste. These calculations are extremely difficult, if not impossible, to perform exactly; however, Dr. Cohen has made reasonable assumptions and has arrived at results that provide an overall perspective of relative risk. Most of his calculations involve rather conservative assumptions, although I will later take issue with his calculation of the "lives saved" by the mining and use of uranium by the nuclear industry.

If nuclear power is indeed so safe, why is the nuclear power industry currently at a standstill? Surprisingly, Americans have yet to make a firm commitment to nuclear power. We may be approaching a point where we will lose the ability to manufacture nuclear power plants without a significant relearning effort. Dr. Cohen suggests that the media are an important factor in this paralysis, and one only has to compare media coverage of radiation issues with other issues to agree that the media are indeed biased. For example, most of us remember vividly the media event surrounding the Three Mile Island accident in March, 1979. Few people remember, however, that in August of that same year, a dam

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[1] B.L. Cohen, "The Cancer Risk from Low-Level Radiation," *Health Physics* 39 (1980): 659-678; and idem, "The Role of Radon in Comparisons of Effects of Radioactivity Releases from Nuclear Power, Coal Burning and Phosphate Mining," *Health Physics* 40 (1981): 19-25.

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broke in India and killed at least 1,000 people.[2] If this had been a nuclear reactor accident, I have little doubt that it would have had a profound impact on nuclear power in this country. The dam accident, however, has had no obvious effect on our hydroelectric power industry, even though there has been a significant number of deaths from dam failures in the U.S. (about 3600 since 1874).[3]

The media's position, however, is not based entirely on whim. We should search for more fundamental reasons if we want to understand this problem, but that is not my intent here. Instead, I shall examine the issue of disposal of high-level radioactive wastes. Dr. Cohen assures us that this is not a problem in terms of eventual health effects, but, in fact, we don't have a single operating, permanent waste-disposal facility. This is not consistent with the proposed assurances, and the responsibility for this rests squarely on the shoulders of the industry and its government promoters and regulators. Until such a facility is in place and is operating safely, I suggest that nuclear power will continue to be viewed with suspicion.

On a more positive note, I would reemphasize one of Dr. Cohen's points: We do indeed know a great deal about radiation and its effects on biological systems and about radionuclides and how they are transported through environmental media. There are predictive models of radionuclide movement, dose to man, and radiation-induced effects that are really quite good. By comparison, we know much less about pollutants from other major sources of energy. The nuclear industry and its government promoters and regulators deserve praise for evaluating the health effects of low-level radiation. This task has been difficult because the effects are so small that they are not observable in reasonably sized populations. We therefore must extrapolate from data based upon exposure to high levels of radiation.

Dr. Cohen has presented a good deal of evidence to explain why these extrapolations overestimate the harmful effects of low-level nuclear radiation. One of the most significant sets of data for these extrapolations is the mortality experience of the Japanese survivors of the atomic bombs at Hiroshima and Nagasaki. Great interest was aroused when Loewe and Mendelsohn[4] recalculated the doses from

[2] "Dam Bursts in India — Flash Flood Kills 1,000," *San Francisco Chronicle* 13 August 1979.

[3] A. Coppola and R.E. Hall, *A Risk Comparison* NUREG/CR-1916, BNL-NUREG-51338, R7, RG (Upton, N.Y.: Brookhaven National Laboratory, 1981).

[4] W.E. Loewe and E. Mendelsohn, "Revised Dose Estimates at Hiroshima and Nagasaki," *Health Physics* 41 (1981): 663-666.

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the bombs with advanced techniques. They reported that the neutron doses in both cities were lower than previously thought, but that the gamma-ray and total doses were higher in Hiroshima and lower in Nagasaki. These new doses results have been used by Straume and Dobson[5] to recalculate dose-response data for the induction of malignancies. While these results must be considered preliminary, the new response curves of the mortality from leukemia versus dose now show no intercity difference and are more consistent with other data. The data also indicate a linear-quadratic response, but the calculated risk coefficient is consistent at low doses with previously calculated values. Thus, we are encouraged that these new results will strengthen the basis of the calculation of risk from radiation.

I would advise caution in assuming that all chemical carcinogens exhibit a linear, no-threshold dose response. Dr. Cohen has apparently made this assumption for cadmium and arsenic. It is not certain that orally administered cadmium is carcinogenic at all,[6] and no dose-response function can be derived. The situation is even more confused for arsenic, as this element is now considered essential.[7] While it has been demonstrated to be carcinogenic at high doses,[8] the response function may be very complex and the addition of small amounts per individual may even be beneficial rather than detrimental.

Finally, I take issue with Dr. Cohen's conclusion that 500 lives per plant-year can be saved through the mining of uranium, the mining presumably preventing the emission of radon. Cohen's original calculations[9] were somewhat different; he calculated that release of radon from tailings piles would cause 150 deaths, which would mean a savings of 350 lives per plant-year of operation. This calculation is based on the assumption that the unmined uranium would eventually come to the surface (through erosion), release radon, and produce lung cancer. It would also have to be assumed the uranium used in a reactor would not lead to further radon emissions.

I don't find this credible for several reasons. First, the assumption

[5]T. Straume and R.L. Dobson, "Implications of New Hiroshima and Nagasaki Dose Estimates: Cancer Risks and Neutron RBE," *Health Physics* 41 (1981): 666-671.
[6]U.S. Environmental Protection Agency, *Ambient Water Quality Criteria for Cadmium* EPA-440/5-80-025 (Washington, D.C.: EPA, 1980).
[7]W. Mertz, "The Essential Trace Elements," *Science* 213 (1981): 1332-1338.
[8]U.S. Environmental Protection Agency, *Ambient Water Quality Criteria for Arsenic* EPA 440/5-80-021 (Washington, D.C.: EPA, 1980).

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that uranium used in a reactor will produce no further emissions of radon is questionable. Its half-life is 4.5×10^9 years, and it is probbably as likely to resurface in that time as is the unmined uranium. Also, the process of mining and milling brings to the surface and leaves in tailings piles equal radioactivities of 230 Th (half-life = 7.7×10^4 years) and 226 Ra (half-life = 1600 years). These are daughter products of uranium that has *already decayed,* and each of them will subsequently decay to an atom of radon. Bringing them to the surface will result in the release of radon (half-life = 3.8 days) that otherwise would never have reached the surface, but would have decayed harmlessly underground.

While I generally support Mr. Cohen's calculations and results, I believe that the impact of nuclear power on the emission of radon should be recalculated.

[9]Cohen, 1981.

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COST-BENEFIT ANALYSIS, ENVIRONMENTALISM, AND RIGHTS

Richard N. Langlois

People today are therefore far less divided than one imagines; they argue incessantly to know into which hands power will be placed; but they content themselves calmly with the duties and rights of that power.

—de Tocqueville[1]

To the practical mind, particularly one trained in economics, it might sound a trifle paradoxical to suggest that the truly important issues in a public policy debate have nothing to do with the relative efficacy of the policy options. Paradoxical or not, this is very often the case. And there is no better illustration than the ongoing — and heated — debate over alternative approaches to pollution control. Issues of workability and economic efficiency are certainly prominent in this policy discussion. But, as with many political questions, the more important issues lie at a deeper, or at any rate a less visible, level.

In political terms, this debate has lately come to be portrayed as a bipolar struggle. On one side stand economically minded Reaganites, who favor applying the test of cost-benefit analysis to all administrative regulations put forth by the government and who support "economic" approaches to pollution control. On the other side are environmental, "consumer," and other groups, who oppose the use of cost-benefit analysis and who are suspicious of any

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[1]Alexis de Tocqueville, in J.P. Mayer, ed., *De la Démocratie en Amérique: Les Grands Thémes* (Paris: Gallimard, 1968), p. 315 (translation mine).

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"economic" approaches. The dialectic between the two points of view came to some national attention this past summer when the Supreme Court barred one federal agency from employing cost-benefit analysis in formulating its regulations.[2]

One consequence of this controversy is that the ethical and philosophical underpinnings of cost-benefit analysis and "economic" regulatory techniques have come increasingly under fire from environmentalists and others. Most critics have taken the moral high-road, charging that utilitarianism — the doctrine underlying cost-benefit analysis — is ethically flawed and morally inferior. In so arguing, most critics have also insisted upon berating utilitarianism for its inattention to basic human rights and for its willingness to "tradeoff" values that should be considered absolute.

My intention in this paper is not to defend utilitarianism or cost-benefit analysis. It seems to me that the critique of utilitarianism offered by environmentalists (and others) is very often on target. Rather, my point is that a critique of utilitarian moral philosophy is not by itself a critique of the use of cost-benefit analysis in regulatory decision-making. What is universally overlooked, I contend, is that the latter necessarily involves a *joint* critique, a simultaneous critique of both cost-benefit analysis (or utilitarianism) and the institutional structure of regulation to which that approach is applied.

One implication is that — perhaps surprisingly — the ethical case for utilitarian behavior by an agent (or agency) acting for a political collective can be strong even when the ethical case for utilitarian behavior by an individual is weak. This does not mean that centralized administration using cost-benefit analysis is desirable. There are good reasons for wishing to rid social governance of the technocratic. But an ethics of basic rights and absolute claims requires an institutional structure appropriate to such rights and claims.

There do exist rights-based regulatory alternatives, some based on historic conceptions of rights in common law and some based on government-granted "pollution rights." One might thus expect that, whatever pragmatic reservations they might have, opponents of cost-benefit analysis would be somewhat sympathetic to such rights-based schemes on philosophical grounds. In fact, quite the opposite is the case. Environmentalists, for example, bristle at the

[2]See, e.g., Philip Shabecoff, "Safety Agency to Forgo 'Cost-Benefit Analysis,' " *New York Times*, 13 July 1981.

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very mention of rights-based pollution regulation, and insist on maintaining centralized administrative control. The reason for this, I will be forced to conclude, is that, in the end, the environmentalist is concerned with basic human rights to no greater extent than is the utilitarian economist. And recognizing this is the key to understanding what the debate over pollution policy is really all about.

It is fairly easy to demonstrate, I believe, that, in one sense at least, this policy debate is *not* ultimately a battle between groups with radically different philosophies. The argument between Reaganites and environmentalists, I will suggest, is ultimately a tussle between formally identical political philosophies — both of which are "conservative" in a well-defined sense — that disagree only about the specific constellation of personal virtues each wishes regulation to promote.

The Critique of Cost-Benefit Analysis

One of the most persistent beliefs about cost-benefit analysis and related disciplines, writes Laurence Tribe, "is a conviction of their transparency to considerations of value and their neutrality with respect to fundamental world-wide views and to more-or-less ultimate ends."[3] This, says Tribe, is much mistaken. Such techniques necessarily imply a world-view of their own — the world-view of economic utilitarianism.

Modern policy-analytic techniques, he argues, are wedded to an "instrumental" conception of rationality. Also referred to as "means/ends" rationality, this conception defines the rationality of a policy or action in terms of its efficacy — or, indeed, its optimality — in achieving a stated goal.

In a typical cost-benefit analysis, the social questions are framed in terms of a "social decision" — whether to institute a regulation, how much pollution to allow, whether to lease certain offshore oil tracts — understood in strict analogy with an individual decision. The relevant structure of means is established by the analyst, in the service of the (often hypothetical) "decision-maker," and the objective is to choose the best social policy in light of "social" costs and benefits, of the somehow aggregated preferences of the many individuals who would be affected.[4]

[3] Laurence H. Tribe, "Policy Science: Analysis or Ideology?" *Philosophy and Public Affairs* (1972), p. 75.

[4] In simple terms, one chooses the option with the highest net "social benefit" over "social cost." More formally, though, one is normally concerned with picking a

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There are two closely related considerations that Tribe and like-minded critics adduce against this approach: reductionism and collapsing process into result. Cost-benefit techniques operate by disassembling the effects of a "social decision" into its component parts, ascertaining the benefit or cost of each part, and then totaling up the results. This procedure obscures and does violence to the very complex and not fully measurable web of social valuation that actually underlies the problem. In particular, the cost-benefit technique is *ad hoc* and ahistoric; it is concerned only with the goal of maximization, relegating all else — including human rights — to the derivative status of means toward that end.[5]

Interestingly, Tribe illustrates his complaint by reference to the literature of law and economics. In the dominant form of the economic approach to law, which Tribe traces to Ronald Coase and Guido Calabresi,[6] and which we would now associate with the name of Richard Posner,[7] the assignment of rights for purposes of tort law is conceived, as both a descriptive and a normative matter, in terms of the "efficiency" of the allocation.

In the classic example analyzed by Coase,[8] a train passing through farmland emits sparks that set afire and destroy the wheat growing on a farmer's land near the tracks. The efficiency approach to law asks: Does the farmer have a right to grow wheat unmolested (and therefore a claim against the railroad) or does the railroad have a right to emit sparks? The answer, according to the efficiency view, should depend — and in fact has depended — upon which assignment of rights maximizes net wealth, that is, upon which assignment minimizes the sum of wheat-destruction and fire-avoidance costs.[9] Indeed, when there are no transactions costs (like the costs

"Pareto-improving" choice, i.e., a choice that makes at least one person better off without making anyone worse off. In circumstances in which income redistribution is possible, this criterion reduces to the excess-social-benefits-over-social-cost criterion. Indeed, under the so-called Kaldor-Hicks criterion, one need show only that the best choice is a *potential* Pareto improvement — that the winners could in principle (or in the absence of transactions costs) compensate the losers, even though the losers need never actually be compensated. See generally E.J. Mishan, *Cost-Benefit Analysis*, 2d ed. (New York: Prager Publishers, 1976).

[5] Tribe, "Technology Assessment and the Fourth Discontinuity: The Limits of Instrumental Rationality," *Southern California Law Review*, 46 (1973): 627-631. Readers of Robert Nozick (whom Tribe cites) will recognize an affinity to the arguments in *Anarchy, State, and Utopia* (New York: Basic Books, 1974), esp. chap. 7.

[6] Tribe, "Technology Assessment," notes 37 and 38.

[7] See generally Posner, *Economic Analysis of Law* (Boston: Little, Brown & Co., 1972).

[8] "The Problem of Social Cost," *Journal of Law and Economics* 3 (October 1960): 1.

[9] As I will suggest below, maximizing wealth is not the same as maximizing utility. Posner makes this distinction and defends the wealth-maximization approach in

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of organizing dozens of farmers to bargain with the railroad), the initial assignment of rights is irrelevant, since, through bargaining, the right would ultimately be acquired by the party whose exercise of it maximizes net wealth. When there *are* transactions costs, it is the job of the court to undertake a wealth-maximization calculation and to assign the right to the party who would ultimately have possessed it had there been no transactions costs.

To Tribe, this attempt to analyze the assignment of rights from the common-denominator of wealth obscures the complex sociocultural role that rights play in a person's structure of preferences; "for to be 'assigned' a right *on efficiency grounds* fails to satisfy the particular needs that can be met only by a shared social and legal understanding that the right belongs to the individual because the capacity and opportunity it embodies is organically and historically a part of the person that he is and *not* for any purely contingent and essentially managerial reason."[10]

Reading Tribe and other critics, one is left with a strong sense that utilitarianism and cost-benefit analysis are flawed — and are to be rejected — because of their callousness towards the individual, his rights, and the processes by which those rights are exercised. "The notion of human rights," as Steven Kelman puts it in his recent "ethical critique" of cost-benefit analysis, "involves the idea that people may make certain claims to be allowed to act in certain ways or to be treated in certain ways, even if the sum of benefits achieved thereby does not outweigh the sum of costs."[11] A right is not something that can be assigned on "efficiency" grounds; a right is precisely an individual's "trump"[12] against the claims of efficiency, his protection against social "utility monsters" like the one that recently devoured the Poletown section of Detroit.[13] The problem

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"Utilitarianism, Economics, and Legal Theory," *Journal of Legal Studies* VIII (January 1979), p. 103.

[10] Tribe, "Technology Assessment," p. 629, emphasis original. This quotation may perhaps paint the argument as rather vague and emotional. But other philosophers have argued a similar point on logical grounds. See, for example, Charles Fried, *Right and Wrong* (Cambridge: Harvard University Press, 1978), esp. pp. 102-104.

[11] Steven Kelman, "Cost-Benefit Analysis: An Ethical Critique," *Regulation*, January/February 1981, p. 36.

[12] "Trump" is a term favored by Ronald Dworkin. See his *Taking Rights Seriously* (Cambridge: Harvard University Press, 1977).

[13] For a coherent account, see William Safire, "Poletown Wrecker's Ball," *New York Times*, 30 April 1981, p. A31. I should note that it seems unlikely that Detroit's abuse of eminent domain powers was a real utility monster in the sense that the sum of benefits actually outweighed costs. To the contrary, it strikes me as likely that the project was, by most standards, a big utility loser. This underscores a point I will

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with cost-benefit analysis, we are encouraged to believe, is that, in reducing social questions to the common metric of a homogenized utility, it treats human beings — and their historically rich and idiosyncratic circumstances — with insufficient respect.

I'm inclined to agree. To a large extent, this is indeed the problem with cost-benefit and related approaches. But I'm also inclined to think that this line of criticism is neither central to, nor maintained consistently in, the thinking of Tribe, Kelman, or other environment-minded critics.

Utilitarianism, Moral Theory, and Political Theory

Early on in his critique, Kelman marvels at the complacency of economists in using cost-benefit analysis uncritically at a time when that technique's philosophical underpinnings — utilitarianism — represent "a minority position among contemporary moral philosophers."[14] Controversiality, or even unfashionability, is never a very good argument against a philosophic doctrine. But it is certainly true that the recent trend in political philosophy (let alone moral philosophy) has been away from utilitarianism and toward theories of basic human rights. In chiding economists in this way, Kelman would seem to be allying himself with those he describes as the "non-utilitarian philosophers."[15] He is not entirely unjustified in allowing us to draw this inference; but, as I will eventually suggest, his reasons for objecting to utilitarianism are ultimately rather different from those of the more prominent of these philosophers.

The Two Forms of Utilitarianism

Let me begin with a not-so-minor quibble about Kelman's attack on utilitarianism.

Utilitarian doctrine comes in two basic flavors. The primary version, and the one Kelman implicitly means when he says "utilitarianism," is "act" (or sometimes "extreme") utilitarianism. As a moral theory, act-utilitarianism holds, roughly speaking, that a person's action is morally correct when the benefits to society of taking the action outweigh the costs to society. Given such a definition, it is quite easy to construct, as Kelman does, hypothetical situations in which the balance of costs and benefits makes it

make below: It is not utility calculations so much as the notion of an overriding "social interest," however constructed, that causes "monsters."

[14] Kelman, p. 34.

[15] Ibid., p. 36.

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morally correct (say) to lie, to break a sworn promise, or to frame an innocent man — and actually immoral by definition *not* to do so.

Rule-utilitarianism, advanced in large measures in reaction to act-utilitarianism's counter-intuitive quality, is quite a different matter. Here the cost-benefit test is applied not to an individual's actions directly but to a rule or system of rules. That system of rules is best which maximizes social utility; and the morality of an individual's conduct is measured by its conformance with the maximizing set of rules — not by its own costs and benefits measured in isolation.[16] Rule-utilitarianism is an institutional or, as they tend to say nowadays, a "systemic" notion.

This immediately points up a small flaw in Kelman's analysis. Are we not entitled to view pollution, health, and safety regulation as problems in the selection of systems of rules? To the extent that this is so, the application of cost-benefit analysis to regulatory decisions may very often be understood in rule-utilitarian — not act-utilitarian — terms. It may remain, as I am indeed inclined in part to agree, that such decisions should *not* in the end be made on utilitarian grounds; but this follows not at all from Kelman's arguments against "utilitarianism."[17]

Utilitarianism (of either sort) is a consequentialist or "teleological" form of moral theory: It postulates a conception of the good (in this case social utility) and deduces the right — the set of moral rules — using the logical procedures of maximization theory.[18] The good is prior to the right, and moral rules are but in-

[16] Modern discussions of rule-utilitarianism generally trace from John Rawls's seminal article, "Two Concepts of Rules," *The Philosophical Review* LXIV (1955), reprinted in (among other places) Michael D. Bayles, ed., *Contemporary Utilitarianism* (Garden City: Doubleday, 1968), p. 59. (Sir Roy Harrod's article "Utilitarianism Revised," *Mind* 45 (1936): 137, seems to have attracted far less attention.) The concept probably goes back at least as far as Hume, though, and there is much discussion over whether John Stuart Mill was a rule-utilitarian. The terms "act" and "rule" themselves were not coined until 1959 by R.B. Brandt, *Ethical Theory* (Englewood Cliffs, N.J.: Prentice-Hall).

[17] Kelman notes that a sophisticated act-utilitarian will include in his calculation the effect his action might have on his own and other people's future propensity to follow utilitarian precepts, and he is careful in his own examples to construct situations in which the act in question has only negligible effects on the institutions of truth-telling, promise-keeping, law enforcement, etc. But this makes act-utilitarianism no less exclusively the focus of his arguments; rule-utilitarianism requires that one obey the institutional rule even when, as it were, the existential costs and benefits suggest otherwise. Of course, this is not to say that cost-benefit analysis is ever actually used in a rule-utilitarian way. But that is a different argument from the one Kelman makes, and it is not an indictment of utilitarianism in principle.

[18] See, for example, John Harsanyi, "Morality and the Theory of Rational Behavior," *Social Research* 44 (1977): 623; and "Rule Utilitarianism, Rights, Obligations, and the

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struments for achieving the good. There is also a quite different kind of moral theory: non-consequentialist or "deontological" theory. And it is here we must look to find the center of gravity of modern "non-utilitarian" thought.[19]

Deontological Moral Theories

A deontological theory turns the tables and gives priority to the right over the good. Instead of attempting to derive the appropriateness of a rule solely from a consideration of consequences, it seeks to deduce rules from more primitive postulates about rules themselves. This approach is no less "rational" than utilitarianism. But it may arguably be "rational" in a different sense; and if there is a distinction between instrumental and non-instrumental rationality, perhaps here is where that distinction is to be made.

Almost without exception, recent non-utilitarian theorists have chosen to associate themselves with the teachings of Kant and, in particular, with the notion that a theory of rights should derive from a consideration of the person and an analysis of the treatment appropriate to him. Philosophers have differed in their interpretations of Kant on this score, but all agree that moral behavior involves treating others with suitable respect. Some emphasize a respect for the historical uniqueness and particularity of the individual, while others stress not respect for its own sake but the equality with which an institutional structure displays such respect.[20]

To Charles Fried, for example, systems of rights must embody "a respect for persons as the ultimate moral particulars. . . ."[21] Robert Nozick holds that such a system must "reflect the underlying Kantian principle that individuals are ends and not merely means; they may not be sacrificed or used for the achieving of other ends without their

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Theory of Rational Behavior," *Theory and Decision* 12 (June 1980).

[19] My own view is that rule-utilitarianism of a very sophisticated sort is not without merit — and, indeed, not entirely inconsistent with deontological theories. But this is not the place to elaborate this view. (I'm thinking here especially of the work of F.A. Hayek. See his "Notes on the Evolution of Systems of Rules of Conduct," in *Studies in Philosophy, Politics, and Economics* (Chicago: The University of Chicago Press, 1967); and generally *Law, Legislation, and Liberty*, vol. 1: *Rules and Order* (Chicago: The University of Chicago Press, 1973).) In examining deontological theories in this section, I mean primarily to contrast this important school of "non-utilitarian philosophers" with the ideas of Kelman, Tribe, and other pro-environment writers who attack utilitarianism.

[20] H.L.A. Hart, "Between Utility and Rights," in Alan Ryan, ed., *The Idea of Freedom, Essays in Honour of Sir Isaiah Berlin* (Oxford: Oxford University Press, 1979), p. 77.

[21] Fried, p. 20.

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consent."[22] And Ronald Dworkin speaks of "the vague but powerful idea of human dignity," associated with Kant, which "supposes that there are ways of treating a man that are inconsistent with recognizing him as a full member of the human community and holds that such treatment is profoundly unjust."[23]

Like utilitarian approaches, deontological theories are both moral theories and political-institutional theories. This is so not merely because their authors invariably jump back and forth between the two realms; rather, it is because the moral and the institutional cannot easily be separated. This is not therefore to say that a moral theory is immediately a political or institutional one; indeed, many of the difficulties that arise in trying to find moral foundations for social policy attend a careless transition from the level of personal morality to the level of social institutions.

The connection between the two levels is illuminated by casting moral prescriptions in the language of rights. A deontological moral theory yields a system of rules or, as Fried argues, of "moral absolutes"[24] that can be understood as moral rights. The problem, as we'll see, then becomes one of transforming into political or legal rights whichever moral rights emerge from one's moral theory.

Ethics and Institutions

Those who criticize the use of cost-benefit analysis in regulatory decision-making are frequently quite anxious to talk in terms of rights and absolute claims and to deride utilitarianism for ignoring such claims. "We do not do cost-benefit analyses of freedom of speech or trial by jury," says Kelman. "The Bill of Rights was not RARGed. . . . [T]he Emancipation Proclamation was not subjected to an inflationary impact statement."[25] What this seems to imply is that administrative decisions by regulatory agencies are logically equivalent in form to the Bill of Rights or the Emancipation Proclamation, and that non-utilitarian regulation somehow involves

[22] Nozick, p. 30.

[23] Dworkin, pp. 198-199. Not content to stop here, though, Dworkin quickly adjoins this to the notion of political equality, which "supposes that the weaker members of a political community are entitled to the same concern and respect of their government as the more powerful members have secured for themselves. . . ."

[24] Fried, p. 81.

[25] Kelman, pp. 35-36. The remark about the Emancipation Proclamation was evidently made by the United Steelworkers Union in a comment on an OSHA rule "to reduce worker exposure to carcinogenic coke-oven emissions." The acronym RARG refers to a risk-analysis procedure, I believe.

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inserting absolute claims directly into the rule-making process as now constituted. But to believe this, as you might guess, is in fact to make a number of illegitimate leaps.

Positive and Negative Rights

Let's back up. On the level of moral theory, once again, it is possible to cast the imperatives of deontology in terms of rights. For example, a Kantian respect for the person dictates that one has an obligation not to harm someone else intentionally; another way to say this is that a person has a moral right not to be harmed intentionally by another. This right against harm is a *negative* right: it dictates what you may not do *to* me rather than what you must do *for* me. There are also positive rights, which do detail what you (or some specified persons or institutions) must do for me: a child, for example, may be viewed as having a positive right to proper care and feeding. This is a much-used distinction, and it is not, I think, controversial.

The important point is that the two types of rights are not symmetric. A negative moral right can carry over immediately into the institutional realm without much ado. If I have a moral right not to be harmed,[26] this can quite easily become a legal right not to be harmed. But if I have some kind of positive moral right, I cannot transform into the institutional realm without specifying the institutional mechanism that is to provide me with the content of my positive legal right. (Whom do I take to court if I don't get fed?)

Positive legal rights always make a claim on the resources of others. As Fried puts it, such rights "are inevitably asserted to scarce goods, and consequently scarcity implies a limit to the claim. Negative rights, however, the rights not to be interfered with in forbidden ways, do not appear to have such natural, such inevitable limitations."[27] Moreover, some positive rights have more natural limits than others. For example, it is quite clear — to within fairly narrow limits — what it means to give someone a jury trial. But it is far less clear what it means to give someone "a clean environment" or "safety."

For the most part, the Emancipation Proclamation and the Bill of Rights guarantee *negative* rights. And there is no problem in deducing negative political rights of this sort directly from a deontological moral theory. (In fact, these particular rights accord extremely well

[26] Of course, *enforcing* that right may involve a positive right: The right to law-enforcement services; but that makes the right against harm itself no less negative.
[27] Fried, p. 110.

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with Kantian theories.) But what about an Occupational Safety and Health Administration (OSHA) or Environmental Protection Agency (EPA) rule? Can such a rule be determined on deontological grounds?

The first thing to notice about an OSHA or similar ruling is that it is not easily cast in terms of rights at all. Such a rule is an administrative directive requiring specific people to do specific things; it accords relative privileges to some parties and imposes various obligations on others, but it does not grant anyone a right.[28] Secondly, and relatedly, an administrative regulatory directive is ahistoric and *ad hoc;* it quite literally collapses process into result. Administrative regulation takes a situation as given; it does not view that situation as the result of a historical process in which certain basic rights may have been violated. And it therefore sees its function as correcting the *ad hoc* situation by direct manipulation rather than as redressing historic violations of rights. The most egregious example of this adhocery is the "best available control technology" (or, invariably, "BACT") form of regulation ubiquitous in present-day U.S. pollution control policy.[29]

This immediately suggests that the administrative approach to regulation *qua* institutional mechanism bears a strong formal similarity to act-utilitarianism *qua* moral theory. To put it another way, the logic of conceiving the regulatory problem as an *ad hoc* "social decision" is very much refractory to the logic of rights. And herein lies a source of great intellectual confusion among those who wish to discuss regulation in the language of human rights while implicitly assuming the institutional structure of *ad hoc* administrative regulation.

Kelman once again provides an example. "When officials are deciding what level of pollution will harm certain vulnerable people — such as asthmatics or the elderly — while not harming others," he writes, "one issue involved may be the right of those people not to be sacrificed on the altar of somewhat higher living standards for the rest of us."[30] The message Kelman takes from this seems to be that officials should therefore decide the question of pollution level on other-than-utilitarian grounds.

In fact, it seems to me, the implication is far more radical than that.

[28] On the distinction between administrative or "public" law and rights-based or "private" law, see generally Hayek, *Law, Legislation, and Liberty.*

[29] A BACT rule specifies not merely an allowable level of pollution but the particular technology one must use in pollution control.

[30] Kelman, p. 36.

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If an asthmatic has a right against being "sacrificed" on the altar of progress, it must mean that she actually has some more fundamental right against being harmed by pollution. Her fundamental right is directed against the polluters; and her "right" not to have her right overriden by the social decision-maker is only derivative of that more fundamental right. But if people have rights against polluters, then those rights will themselves serve to determine the appropriate level of pollution.[31] Therefore, to assert the existence of such moral or legal rights is not to suggest alternate criteria for central decision-making but to argue for what is at least in part an alternate *institutional arrangement.*

In fact, since a right against pollution is a negative right, deriving somehow from the negative moral obligation not to harm others, a scheme of pollution rights transform directly from the moral to the legal realm. There are a number of interesting issues involved in such a transition; many of these — particularly the "efficacy" issues — have been dealt with elsewhere during this symposium. The result seems fairly clearly to be that decentralized rights-based systems, whether founded entirely on historic conceptions of rights in common law or on the better-known "economic" approaches to pollution rights, present a far stronger case on efficacy grounds than do conventional administrative schemes (like BACT). I'll leave it to others to argue this position — not merely because to pursue that analysis would take me far afield but also because, as I will suggest again shortly, a dispute about efficacy is not wherein the opposition to such schemes lies.

My argument is more modest, though perhaps more important to understanding the philosophical — and ideological — structure of the debate over regulation. And the argument, once again, is this: An insistence upon absolute moral claims in regulatory matters is closely bound to a decentralized system of legal rights and antagonistic to a conception of centralized decision-making.

Duties and Central Decisions

Perhaps this can be seen more clearly by turning the problem around and looking at it from the other side. Consider a situation in which, for various irrelevant reasons, a person or government agency is forced to make a central decision that affects the allocation of

[31] That is to say, the process of adjudicating claims against polluters will determine the level of pollution. The "correct" level is the level at which no one's rights are found violated. This may be very little pollution in some cases and quite a lot in others.

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resources among competing claims — and perhaps even the life and health of human beings. Should this decision be made on some sort of utilitarian grounds? I would argue that there is actually a good case for an affirmative answer.

Let's begin at the level of individual moral decision. Suppose you have at your command resources that could save the lives of a small number of people if used in one manner but could save the lives of a separate and much larger group if used in a different way. Which group should you save? If you are a non-utilitarian philosopher, the answer is not necessarily obvious.

In an intriguing and challenging article, John Taurek, for example, argues that the number of people involved should not be a factor in such a moral decision. The reason one wishes to save a human being from harm, he argues, is that one empathizes with him as a fellow human being — not because the individual has some objective value in the sense that an inanimate thing may have value. "The loss of an arm of the *Pietà* means something to me not because the *Pietà* will miss it. But the loss of an arm of a creature like me means something to me only because I know he will miss it, just as I would miss mine. It is the loss *to this person* that I focus on. I lose nothing of value to me should he lose his arm. But if I have a concern for him, I shall wish he might be spared his loss."[32]

To Taurek, there is thus no additivity — there is nothing to add up — in moral decisions of this sort. It is no greater loss *to any individual* because he perished with a larger rather than smaller number of others. And, therefore, one is morally justified in saving the smaller number if there are special considerations (e.g., friendship with particular individuals) involved — or indeed in flipping a coin to decide which group to save if there are no special considerations.

This analysis seems to me to capture some of the meaning behind the notion that we should value each life infinitely; but it also has some strongly counterintuitive implications seldom considered by those who trumpet the infinite value of life. My point here is that, however one feels about this analysis of individual moral choice, the logic of analysis in the case of a "collective" choice will be quite different.

Taurek analyzes the situation faced by a Coast Guard captain try-

[32] John M. Taurek, "Should the Numbers Count?" *Philosophy and Public Affairs* 6 (Summer 1977): 307. Taurek's analysis is not only Kantian but, it seems to me, arguably Smithian, in the sense of Adam Smith's *Theory of Moral Sentiments* (Indianapolis: Liberty Classics, 1976), which bases morality on what the eighteenth century called the sentiment of sympathy — what we would now call empathy — with one's fellow man.

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ing to rescue the inhabitants of an island being engulfed by a volcanic eruption. One small group has congregated on the south side to await rescue, while a much larger group has assembed on the north side. The captain can save only one group before the island is destroyed. Which shall it be? If the captain were at the helm of his own ship, Taurek would be content to have him flip a coin; but, since he is a public official, the logic of the situation is entirely different. The reason people would instantly assert that the captain should head north, he says, is "that in the minds of those who are so quick to judge it is assumed that each of those in jeopardy has a citizen's equal claim to the use or benefit of that resource. For these reasons the Coast Guard captain is seen as *duty-bound* in the situation; duty-bound to behave in accordance with a policy for the use of that resource agreeable to those whose resource it is. Hence the considerations operative here are quite different from those relevant to the decision of a private citizen captaining his own ship or dispensing his own drug or reaching out his hand under no moral constraints but those that would fall on any man."[33]

The position of the "social decision-maker" at the EPA or OSHA is entirely analogous to that of the Coast Guard captain; his duties are public ones, and his decisions about pollution or worker safety affect the allocation of other people's resources. Thus it seems to me more than arguable that this decision-maker is morally duty-bound to balance competing claims, to make tradeoffs, to let the numbers count — indeed, to undertake cost-benefit analysis.

The Ideology of Regulation

We are left with a question. If the institutional structure of centralized administrative regulation is so antagonistic to the basic human rights and absolute claims so often cited by environmentalists, why do they and their allies so strongly support that form of regulation?

Intellectual confusion may be part of the answer. But a careful analysis of the environmentalist position suggests a better explanation.

Values as Outputs

Let's return to the critique of cost-benefit analysis. Much of the complaint, you'll recall, rested on a rejection of "instrumental rationality." An equivalent way to look at the argument is to see it as

[33] Taurek, p. 311, emphasis original.

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an attack on the "fact/value" distinction implicit in cost-benefit analysis.

The cost-benefit analyst implicitly cleaves to a particular form of the fact/value distinction in which people's preferences are taken as given, as unanalyzable primitives that cannot be derived from facts or even questioned "rationally." The critic invariably points out against this view that facts and values are actually closely intertwined: our tastes and values are influenced by our actions just as often as our actions are influenced by our tastes and values. So far so good; but it is not legitimate to conclude from this that the values and preferences of individuals should therefore be transformed in our thinking from an *input* of social decision-making to an *output* of that decision-making.

Tribe is not alone is being unable to avoid the temptation to make exactly this illegitimate leap: For "the whole point of personal or social choice in many situations," he writes, "is not to implement a given system of values in the light of perceived facts, but rather to define, *and sometimes deliberately to reshape,* the values — and hence the identity — of the individual or community that is engaged in the process of choosing."[34] For purposes of social decision-making, values do not come from people; they come, well, from somewhere else. And social policy should not only submit itself to these "higher" or transcendental values but should strive to instill these values in the populace.

That this is indeed the view of present-day environmentalists comes through clearly in Kelman's very useful recent survey of attitudes toward pollution control. Environmentalists, Kelman explains, neither share the economist's radically non-judgmental stance nor believe in economic theorems that "depend on the assumption that the individual is the best judge of his own welfare, and thus that individual preferences be recognized and left alone."[35]

"People should not pollute," opines one of Kelman's respondents. "It should not be up to them."[36]

The environmentalist is concerned not merely with controlling pollution but with controlling the motives and values of the citizenry. "Few environmentalists are willing to be non-judgmental — they condemn pollution. Indeed, that is at the heart of being an environmentalist — to believe, and to propagandize for the belief,

[34] Tribe, "Policy Science," p. 99, emphasis added.
[35] Kelman, "Economists and the Environmental Muddle," *The Public Interest,* Summer 1981, p. 114.
[36] Ibid., p. 113.

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that one ought to have preferences that give a clean environment a strong weight."[37] Thus, administrative-control approaches to pollution regulation are superior to rights-based or "economic" approaches because, in the view of environmentalists, administrative control makes a moral statement against pollution that encourages the development of appropriate preferences.

Kelman himself seems to sympathize with the environmentalist position, at least so far as its attitude toward cost-benefit analysis is concerned. He suggests, for instance, that people possess both "higher" and "lower" preferences. "The latter may come to the fore in private decisions, but people may want the former to come to the fore in public decisions."[38] Cost-benefit analysis, which totes up only these "lower" preferences (what the economist would call "revealed preferences"), thus militates against the expression of "higher" preferences in the "social decision." For example, the individual may well take daily risks that clearly demonstrate his implicit value of life to be rather less than infinity; yet, says Kelman, the same individual may want the political process somehow to value life infinitely — since we often "wish our social decisions to provide us the occasion to display the reverence for life that we espouse but do not always show."[39]

Liberalism: A Definition

This is a political philosophy very different in form from that of the "non-utilitarian philosophers." Despite their many differences, writers like Fried, Nozick, and Dworkin have constructed — on the political-institution level — what we might unambiguously describe as liberal theories.

According to Dworkin's very useful criterion, a liberal political theory is one that is "neutral on what might be called the question of the good life."[40]

What it means for an institutional structure to treat people with dignity or as free, independent, or equal can be understood in two fundamentally different ways. One view holds that "political decisions must be, so far as possible, independent of any particular con-

[37] Ibid., p. 115.

[38] Kelman, "Cost-Benefit Analysis," p. 38.

[39] Ibid. More importantly, Kelman notes, to ascribe pricelessness to life or the environment serves a value-molding function. "Its value-affirming and value-protecting functions cannot be bestowed on expressions that merely denote a determinate, albeit high, valuation."

[40] Dworkin, "Liberalism," in Stuart Hampshire, ed., *Public and Private Morality* (Cambridge: Cambridge University Press, 1978), p. 127.

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ception of the good life, or of what gives value to life." The second position "argues, on the contrary, that the content of equal treatment cannot be independent of some theory about the good for man or the good of life, because treating a person as an equal means treating him the way the good or truly wise person would wish to be treated."[41] Liberalism takes the first position; and the second is occupied by the various kinds of conservatism and most forms of socialism, which do not wish to be neutral with regard to the citizen's conceptions of value.

Dworkin implies that there is only one kind of liberalism by this definition; in fact, I would argue, there are at least two basic forms: the modern (i.e., "1960s") version Dworkin defends and the older or "classical" form.

The neutrality of an institutional system with respect to conceptions of the good is bound up with what Dworkin calls "external preferences" or what I prefer to call "transcendental externalities."[42] Such externalities arise when one person's actions enter into the "utility function" of a second person not because the first is physically or even economically affecting the second but because of what we might call "moralistic" connections.

Consider, for example, the archetypical little old lady in Boston who is offended (whose utility is diminished) by the thought of someone reading pornography in private in Kansas City. The porn reader offends against her "external" preferences, those which reflect her transcendental conception of the good; and if she and her like-minded compatriots happen to outnumber pornography lovers, a vote or cost-benefit analysis might well result in the outlawing of pornography — thus officially establishing one particular conception of the good.

Dworkin feels such situations should be prevented by a system of rights — which cost-benefit analysis or democratic votes cannot override — whenever it is "antecedently likely" that external preferences would otherwise win the day. "The conservative," by contrast, "will not aim to exclude moralistic or other external preferences from the democratic process by any scheme of civil rights; on the contrary, it is the pride of democracy, for him, that external preferences are legislated into public morality."[43]

The modern liberalism of Dworkin is distinguished from classical

[41] Ibid.

[42] See my "Knowledge, Order, and Technology" (Ph.D. dissertation, Stanford University, 1981), chap. 8.

[43] Dworkin, "Liberalism," p. 138.

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liberalism in believing that such transcendental externalities interfere with institutional neutrality only in the area of "social" freedoms — freedom of speech, of sexual mores, of "lifestyle." Neutrality, he believes, does not demand any protections in the less-fashionable area of "economic" freedoms. This contrasts with the view of classical liberalism, which holds that there should be no such asymmetry — that institutions should not be empowered to interfere in "capitalist transactions between consenting adults" any more than to dictate sexual mores.

It is my view that, by Dworkin's own criteria, the asymmetry he argues for cannot in fact be maintained; but this is not the place to make that argument.[44] Indeed, it is significant that we do not have for present purposes to distinguish between the two liberal visions. Environmentalism and related doctrines qualify as neither form.

The liberal wishes political decision-making to be as neutral as possible toward the citizen's conception of the good. Thus, in the case of central decision-making about collective resources, he would be concerned with the idea — mentioned by Taurek and stressed by Dworkin — that each citizen has an equal claim to the benefits of the resource. Utilitarianism, with its classical maxim "everybody to count for one, nobody for more than one," arguably does not apply the principle of equal concern in one form.[45] And, as Dworkin suggests, the problems of non-neutrality in utilitarianism come precisely from *counting* "higher" (or "external") preferences — not from *failing* to employ them sufficiently. Indeed, it should be

[44] But let me try to sketch it. Consider in place of the little lady from Boston the socialist intellectual from Berkeley who is offended because a New York landlord charges a rent above the "just price"; or the unionist who is upset because workers in a distant industry are being paid "unfairly" low wages; or the planner in Philadelphia who is outraged because a developer has plunked a condominium complex on a California beach. In all these cases, external preferences are at work: preferences about what constitutes the good for someone else. And it is not at all unlikely that such preferences could be the cause of government inteference with landlord, industry, or developer.

[45] Let me be clear that I'm not necessarily arguing in favor of utilitarianism (or cost-benefit analysis) applied to centralized regulatory decisions. Although utilitarianism may be neutral in the sense that it treats people as having equal worth, "it does this only by in effect treating individual persons as of *no* worth." (Hart, p. 79.) People are merely instrumental vessels for the aggregate happiness that is of real concern. Utilitarianism counts everyone — and everyone's conception of the good — equally; but it does so by mashing those conceptions into a formless pulp. What I *am* arguing is that, if we *must* make a centralized decision about "public" resources, then we should prefer something like utilitarianism to a criterion involving the decision-maker's perception of "social values" or of the "higher preferences" the citizen would like to see emphasized in public policy but which, alas, he is unable to incorporate into his own decisions.

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obvious that counting "higher" preferences and protecting the claims of individuals are antagonistic notions. Utilitarianism may let loose the occasional "utility monster"; but social decision-making on the basis of "higher" preferences would make public policy look like a remake of *Forbidden Planet.*

Conservatives in Conflict

In the end, environmentalism is a fully conservative political theory. It insists not that the government be neutral with respect to private virtue but that it actively promote a specific set of virtues.

For environmentalists, the relevant value-system is built around an understanding of the proper attitude one should take toward nature or "the environment." Policy should embody and enforce this "environmental ethic." It is for this reason that environmentalists "care about the motives of polluters and wish to stigmatize pollution."[46] One of Kelman's interviewees put it this way.

> A crime against nature is a crime against society. I am part of a policy that has been adopted and that has an important goal. If I violate that policy, that's the same as if I rape, pillage, and burn. Society should be vengeful and punitive against violators of this policy.[47]

[46] Kelman, "Economists and the Environmental Muddle," p. 113. The environmentalists interviewed by Kelman complain that economists do not consider the intentions or motives of actors. This may be so. But deontological theorists do, and, significantly, intention enters in their theories (as far as pollution is concerned) in precisely the *opposite* way from that suggested by the environmentalists. In Fried's formulation, for example, moral force attaches most strongly when the harm is intentional. When a harm is inflicted accidentally or as an unintended byproduct of the agent's intention, compensation may certainly be in order — but the moral force is lessened. To the extent, then, that pollution is merely an unintended by-product of production, moral theory would suggest that such conduct not be subject to the same sanctions as malicious action. Indeed, this is precisely the distinction incorporated in the common law since the Middle Ages: Actions whose intention is malicious are the province of the criminal law, whereas pollution is relegated to the status of a tort under civil law — precisely on the grounds that the harm inflicted is not the primary intention of the agent. This is true even in the case of so-called "intentional torts," in which harm is inflicted deliberately but without malicious intent. (The oft-cited example is the case of a shipowner who deliberately tied his boat to a dock in the storm knowing that this would damage the dock; but his intention was not to harm the dock but to save his boat, so the moral — and legal — force of the action is lessened.) Indeed, environmentalists clearly recognize that this is precisely the nature of our moral intuition about the motives of polluters — it is precisely for this reason that they have so often felt it necessary to insist, however improbably, that modern technology (and its side-effects) developed not as side-consequences of the modest desire of individuals to better their lot but as a conscious, willful attempt to dominate nature. (See, e.g., William Leiss, *The Domination of Nature* (Boston: Beacon Press, 1974).)

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As Dworkin notes in a related context, it is "distinctive to the conservative's position to regard regulation as condemnation and hence as punishment. But he must regard regulation that way, because he believes that opportunities should be distributed, in a virtuous society, so as to promote virtuous acts . . ."[48]

Of course, there are also other — even more familiar — forms of conservatism. Principal among these is good old-fashioned American conservatism, the set of positions which, broadly speaking, characterize the Reaganite view. This form of conservatism also holds that social institutions are to be justified, at least in part, on their ability to produce a society embodying a specific set of values. But the values in this case are, needless to say, somewhat different from those to which the environmentalist clings.

We can see the American conservative analysis at work to some extent in the writings of Posner, who justifies his wealth-maximization theory of rights partly on the grounds that "the wealth-maximization principle encourages and rewards the traditional virtues ('Calvinist' or 'Protestant') and capacities associated with economic progress. The capacities (such as intelligence) promote the efficiency with which resources can be employed; the virtues (such as honesty, and altruism in its proper place), by reducing market transactions costs, do the same."[49]

Wealth maximization differs from utilitarianism in that it wishes to add up not people's unconstrained desires but their "willingness to pay," a notion that explicitly includes the fact of a finite budget. Ignoring the individual's budget constraint — the extent of which constraint is inversely related to that individual's productive contribution to the economy — is, to Posner, the central problem with utilitarianism. "In effect, the choices of the unproductive are weighted equally with those of the productive. This obscures the important moral distinction, between capacity to enjoy and capacity to produce, that distinguishes utility from wealth."[50] Wealth-maximization does not ignore this distinction, a fact arguably qualifying it as a kind of "supply-side" consequentialism in the manner of George Gilder,[51] one that "gives weight to the human impulse, apparently genetically based, to share wealth with people who are

[47] Kelman, "Economists and the Environmental Muddle."
[48] Dworkin, "Liberalism," p. 140.
[49] Posner, "Utilitarianism, Economics, and Legal Theory," p. 124. For a critique by Dworkin, see "Is Wealth a Value?" *Journal of Legal Studies* IX (March 1980): 191.
[50] Posner, "The Ethical and Political Basis of the Efficiency Norm in Common Law Adjudication," *Hofstra Law Review,* Spring 1980, p. 499.
[51] See Gilder, *Wealth and Poverty* (New York: Basic Books, 1981).

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less effective in producing it."[52]

The formal similarity between the environmentalist and the American conservative viewpoints is striking. Both have a coherent vision of the specific set of personal values the good individual ought to embrace, and both are insistent that social institutions be judged by their ability to instill those values in the populace. And both object to utilitarianism not because it treats individuals with insufficient respect, but because it is too indiscriminate — too neutral — in the virtues it rewards and the vices it punishes.

It is in many ways the similarity between the two viewpoints that makes the debate between them seem at times so heated. Both are fighting in the same way for the same turf, which, unhappily, is less the hearts and minds of the citizenry than it is the levers of government. One result has been polarization and caricature, to such an extent that one might almost be forgiven for seeing the dispute as a kind of class-war among conservatives,[53] or at least as a doctrinal squabble between the Low Church of Moral Majority fundamentalism and the High Church of the earth's cathedrals (the Sierras).[54]

On the Liberal Alternative

Let me end on the different note of guarded optimism characteristic of the embattled liberal.

Regulation that promises to establish and promote the value system of one's group over that of others has clear political appeal. An approach to regulation that offers neutrality necessarily evokes a more lukewarm response among the virtuous. But liberal approaches to pollution control — like those based on negative rights in common law — do have the corresponding advantage that they are not necessarily antagonistic to either the conservative's or the environmentalist's system of virtues.[55]

This may be cause for at least a little optimism. Perhaps the warring factions will someday come to recognize the liberal alternative as a mutually advantageous compromise position in the battle of virtue.

[52] Posner, "The Ethical and Political Basis," p. 494.

[53] Cf. William Tucker, "Environmentalism and the Leisure Class," *Harper's*, December 1979.

[54] In what has proven to be one of the seminal works of modern environmentalist thought, medievalist Lynn White, Jr., traced the postulated "environmental crisis" to a problem in Christian theology — to which he proposed a theological solution. ("The Historical Roots of Our Ecological Crisis," *Science*, 10 March 1967.)

[55] One is often inclined — mistakenly, I believe — to see rights-based approaches as

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particularly congenial to the conservative vision. But there is an equally strong case that such approaches accord as well if not better with environmental values. In one article, indeed, Tribe himself seems to recognize this. See his "Towards a New Technological Ethic: The Role of Legal Liability," in T.J. Keuhn and Alan Porter, eds., *Science, Technology, and National Policy* (Ithaca: Cornell University Press, 1981), p. 347.

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THE PHILOSOPHY AND IDEOLOGY OF POLLUTION REGULATION

Charles W. Baird

Richard Langlois warns us to beware of wolves in sheep's clothing: Those who, like Laurence Tribe and Stephen Kelman, inveigh against too much cost-benefit analysis of regulatory policy on the grounds that cost-benefit analysis is likely to trespass against fundamental human rights, may in fact want to defend only some human rights, but to trespass against others in the name of service to, as Kelman puts it, "higher (public) preferences." Such people, as Langlois says, typically are inclined not to regard economic rights as worthy of defense. They are eager, for example, to protect the lifestyle rights of backpackers at the expense of the rights of private owners of undeveloped land, and they do so in the name of protecting the environment. Such people seem to endorse the establishment of an endowed class of morally and intellectually superior people to inculcate higher-order (public) values in the rest of us in order to protect us against the false choices we would make if we were guided by our lower-order (private) values.

Langlois establishes that an alternative to both vulgar cost-benefit analysis that ignores questions of basic human rights and direct administrative control by an endowed elite that trespasses against so-called economic rights does exist and ought to be implemented. His alternative is a rights-based approach involving the adjudication of pollution disputes as torts. Langlois would first identify the correct set of absolute negative claims that each individual has against every other individual and then implement cost-benefit analysis of

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regulation subject to the constraint that this set of negative claims cannot ever be violated. He would first determine what are human rights and then determine what is good regulatory policy by applying cost-benefit analysis wherever those human rights are not thereby trespassed against. In cases where human rights claims seem to be in conflict he would determine good policy through private law adjudication of disputes. His is a rights-before-utility approach. Where, for example, pollution exists he would not impose BACT (Best Available Control Technology) regulations to get rid of it. He would, instead, inquire into the history of the development of the pollution at issue to see whose entitlements were trespassed against and rectify those trespasses. "If people have rights against polluters . . . those rights will themselves serve to determine the appropriate level of pollution." (p. 290)

I agree with Langlois and with Kelman ("Cost-Benefit Analysis — An Ethical Critique," *Regulation,* Jan./Feb. 1981, pp. 33-40) that there is a lot wrong with an unconstrained application of cost-benefit analysis to regulatory questions. In brief, such an approach inevitably leads to the denial of someone's rights. I also agree with Langlois that Kelman, and other advocates of ad hoc administrative control in pollution matters, talk about rights in a sense that is very different from, and logically inferior to, the libertarian view. Such advocates are really selling the tyranny of a "public interest" elite, while libertarians are concerned with defining and defending the rights of all individuals. But Langlois lets Kelman get away with too much. In his first section, Kelman repeatedly attacks cost-benefit analysis by suggesting that cost-benefit proponents are, at least implicitly, utilitarian moral philosophers. While all utilitarian moral philosophers may be advocates of cost-benefit analysis of government regulation, not all advocates of cost-benefit analysis purport to be utilitarian moral philosophers. Harold Demsetz, for example, openly advocates making most regulatory decisions on the basis of cost-benefit analysis, but he would not say that actions with benefits that exceed costs are therefore moral. He would not, as Kelman implies, "permit rape . . . if it could be demonstrated that the rapist derived enormous happiness from his act while the victim experienced only minor displeasure." (Kelman, p. 35)

Murray Rothbard has criticized economists such as Demsetz for ignoring the question of entitlements in their discussions of positive exchange theory. He points out that one cannot engage in what can legitimately be called voluntary exchange with things that one has stolen from others. I believe that is a valid criticism. However, it is

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nonsense to imply, as Kelman does, that those who focus on the narrow question of efficiency are moral cretins. Demsetz would be almost as upset by the ravages of the "utility monster" as he would by the antics of the endowed elite who remake the *Forbidden Planet.* Kelman's suggestion that advocates of cost-benefit analysis must not care about fundamental human rights is at best disingenuous. As Langlois convincingly points out, it is the advocates of ad hoc administrative regulation who, by their actions, betray a lack of concern for fundamental human rights.

Langlois' rights-before-utility approach to externalities problems has long been advocated by Rothbard and others. In my view, exclusive reliance on private law adjudication of torts can effectively deal with most externalities problems. However, in the case of air pollution, the large number of litigants involved makes it very costly to enforce property rights. Thus, in this case a system of government-created exchangable pollution permits might be better than the tort approach. Such a solution, however, is problematic because government cannot identify the optimum quantity of permits to create. Since all costs and benefits are subjective, no government can accurately identify, much less establish, the optimum quantity of anything. But even the tort approach runs up against the immeasurability of costs and benefits: how are damages to be determined?

While Langlois does not tell us nearly enough about identifying rights, he does mount a good defense of (appropriately constrained) cost-benefit analysis in OSHA- and EPA-type decision-making. In keeping with the classical maxim that each person ought to count for one and no one ought to count for more than one when it comes to the disposition of public resources, the Coast Guard captain is bound to save the larger group of people while the captain of a private boat could quite properly save the smaller group that contains people who are, to him, more significant than the people in the larger group. The decision-maker in the case of public resources is "morally duty-bound to balance competing claims, to make tradeoffs, to let the numbers count — indeed to undertake cost-benefit analysis." (p. 292)

One could use Rothbard's argument that collective decisions are never really necessary and that there really is no such thing as a public resource, but in this very imperfect world taxpayer resources are forcibly assembled and the collective will forcibly imposed. If cost-benefit analysis can be used to help tame the leviathan, it ought to be promoted as well as appropriately con-

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strained. Langlois' paper is a useful contribution to at least the former.

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POLLUTION AS MORAL COERCION: CULTURE, RISK PERCEPTION, AND LIBERTARIAN VALUES

Aaron Wildavsky

What is pollution? According to Peter H. Aranson, "Public policy regards as pollution any man-made or naturally occurring substance (for example, smoke or sewage) or condition (for example, noise, heat, or radiation) that is believed to threaten human health or economic welfare . . ."[1] Evidently, pollution is a bad and not a good thing. Alas, bad things happen all the time. There are forms of government and ways of life that make it their explicit purpose to guard individuals against misfortune. The "social insurance state" and the "welfare state" are but a few of the prominent designations of regimes that attempt to guard their members against misfortune. Libertarianism, I take it, is not one of them. So long as individuals are able to try again, and there are no legal limits on transactions, failure serves a positive purpose. It cleanses the system. Without failure on the part of some participants there can be no success, no allocation of resources to higher order uses, no consumer sovereignty. For if there can be no individual failure, there can be no switching of resources away from activities that are unprofitable. Failure is more important then success in that it leaves the way open to try new and better combinations that meet more widespread preferences.

Pollution is a problem for libertarians because some people exer-

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[1] Peter H. Aranson, "Pollution Control: The Case for Competition," in *Instead of Regulation: Alternatives to Federal Regulatory Agencies,* Robert W. Poole, Jr., ed. (Lexington, Mass: D.C. Heath and Co., 1982), pp. 339-393.

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cise power over others without these others being able to fight back effectively. Pollution appears to violate the norm of reciprocity. Market mechanisms do not provide reciprocity because there is no way in which the costs imposed on the polluted can be transferred to the polluter. And the polluter lacks incentive to bear his part of the burden because he is not part of the same market as the polluted. This is the classic dilemma of externalities in which costs are imposed on people who cannot be compensated. How can externalities be internalized, the common question is, so that power is exercised reciprocally rather than unilaterally?

Government regulation to make the polluter pay is unsatisfactory because it violates libertarian principles. Restraints on individuals grow larger rather than smaller. Someone who has no part in a transaction makes decisions for other people who do. Coercion replaces cooperation. Information on preferences and opportunities is diminished instead of expanded. Far better from the libertarian point of view to invent new rules about property that would lead polluter and polluted to make arrangements satisfactory to each other, satisfactory in the sense that there is no alternative arrangement, discoverable at reasonable cost, that would be better for both parties. Thus the debate is framed in the mold of institutional economics, with one side saying that a proposed rule will internalize externalities and the other responding that the parties will not actually get together in the manner suggested.

Here it is useful to summarize the libertarian position in Aranson's paper, by far the best recent exposition:

> . . . in our hypothetical marketplace, no dissatisfaction is brought about by exchange and production external to those who are doing the exchanging and producing. That is, there are no externalities. If this were not so, we could not necessarily guarantee that the price system is efficient.
>
> Consumption and production do create externalities, however. Indeed the world is full of them. Excessive levels of externalities in general, and inefficient levels of pollution in particular, occur because government has failed to construct an adequate property rights system.[2]
>
> . . . The litany of externality abatement — the belief that the presence of externalities calls for an automatic governmental response . . . is flawed for several reasons. First, the effects of externalities and externality abatement are commonly ambiguous, so that reducing a particular externality may increase one person's welfare and diminish another's. Second, the presence of or

[2] Ibid., p. 347.

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> potential for externalities often provides an excuse for politically motivated coercive health or income redistributions. Third, the cost of governmental externality reduction sometimes exceeds the cost of governmental inaction. Fourth, externalities may be acceptable to those who bear them, as evidenced by prior agreement. Fifth, voluntary action may overcome certain externality problems. Sixth, where property rights are established in the presence of low transactions costs, government action beyond enforcing contracts, protecting private property, and assessing damages is at best superfluous. In sum, the presumed self-evident truth that government must regulate human action to suppress externalities seems neither self-evident nor, in many instances, true.[3]
>
> . . . Any attempt to restructure environmental decisionmaking must take cognizance not merely of the theoretical limitations on the justification for governmental action but also of the very real political failures that emerge in our current regime. Furthermore, clean air and water are scarce resources, and many people seek to apply them to competing, incompatible uses. Accordingly, seldom will a particular person be completely satisfied with an environmental-quality program, nor does a perfect program or political arrangement exist. The best we can hope for, as with any other area of social life, is policy that allocates resources to their highest-valued use.[4]

The libertarian solution, in short, is to perfect property relations so there will be no uncompensated pollution.

In this paper I shall argue that acceptance of the probability of widespread pollution profoundly misunderstands the nature of the libertarian way of life. Properly understood, I contend, libertarianism (unlike other modes of social organization) knows no pollution. In anthropology, concepts of pollution and taboo are used to defend boundaries (separating one people from another, kosher from nonkosher). If there are no boundaries against transactions — competitive individualism tears down rather than builds up boundaries — there can be no pollution. For the libertarian there are no permanent uncompensated bads, because eventually markets will arise to internalize the external costs. Until that time, it is simply too costly to do anything, and existing uncompensated pollution (bads) must be tolerated in an imperfect world. Once one understands that saying "the environment is polluted" is equivalent to charging that "markets are dirty," the charge that environmental pollution is ubiquitous can be understood for what it is — a fundamental attack on libertarian culture.

[3] Ibid., p. 369.
[4] Ibid., p. 381.

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It is well-known that libertarians view pollution as a violation of private property rights, and that pollution is a problem for them because of the high cost of establishing markets under certain circumstances. My argument is that sectarians use the moral overtones of pollution as a blanket criticism of collectivism (which includes hierarchic structures such as the modern corporation) and individualism, both of which reject the sectarians' desire for equality of result. This criticism comes as a response to the internal needs of sectarian social organization. Therefore I will outline the dimensions of various competing cultures so we can see how charges of widespread pollution do or do not justify the shared values and social practices that make up these rival ways of life.

Taking Society for Granted

We moderns tend to take society for granted. The eager curiosity of the Enlightenment about the origins and rationale of different forms of social arrangements has been replaced by resignation. This is understandable, but unfortunate. It is understandable that the large-scale organizations under which most people live and the growing complexity of the technology to which they are subject give the appearance, from sheer weight if nothing else, of inevitability. It is unfortunate that society takes on this quality of "givenness" — an axiom rather than a hypothesis — because it cuts us off from an essential source of self-scrutiny. If society were up for grabs, so to speak, with different forms of social relations competing for our allegiance, people might not view themselves as so passive in organizing their experience.

Why do people get together in societies instead of going it alone? The many answers given over the centuries, from preference (man as a social animal) to necessity (man as a beast of prey) have this much in common — advantage. Mankind is supposed to do better together. Society, whether thought of as regulating conflict, so mankind will not devour its children, or securing cooperation, so others will not be able to devour them, is based on mutual support. Fire, flood, famine, war, disease, luxury, and much else is supposed to be more readily managed by joint, rather than individual, action. Stated positively, increasing the good things of the world, from health to wealth, or negatively decreasing "bads," from poverty to sickness to slavery, are the objectives of social arrangements. Society exists to decrease danger and increase safety. The negative (danger) and the positive (safety) are merged by the calculation of risk — the probability of danger, including the costs of averting it

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and the benefits of incurring it. Reformulating the standard answer to the original question, the unsurprising conclusion is that people live in societies in order to reduce their risks.

How, then, do people decide what sorts of risks to take or to avoid? On what basis are certain dangers guarded against and others ignored or relegated to secondary status? By custom or by calculation, mankind copes by playing "follow the leader." Safety is socially learned just as surely as language. Science supposedly has changed all that as imitation gives way to calculation of probabilities. But science cannot say whether it is the variance explained that comforts us or the variance unexplained that should worry us.

Were it possible to calculate risk comprehensively and to agree on a relative ranking of dangers, risk assessment would replace worry about risk. By knowing the risks we face now and into the future, and by assigning them relative rankings, technological choice could overtake social doubt. But can we know?

Coping With the Unknown

If the things of which mankind is collectively ignorant are greater than those of which it has some inkling, the same must be so of the dangers it faces. Objects may be dangerous in ways as yet unsuspected. Should the dangers not yet reveal themselves, they may show up in the more distant future. Apparent dangers, like killer bees, may turn out to be benign because they breed unexpectedly with milder mates. Apparently safe objects — nothing seemed so certainly safe in our youth as asbestos — may turn out to be destructive agents. Mild, harmless substances may combine with others as yet unknown to cause grave damage. Since what is safe today may make us sick tomorrow, even past experience is no certain guide. The opposite also occurs — pesticides believed bad in themselves may increase food productivity sufficiently to improve diets and thus health. There can be no guarantee that the dangers people seek to avoid are the ones that will actually harm them the most. Nor is successful surmounting of danger always a good omen. Success may lead people to relax their guard or deprive them of experience in overcoming adversity. Then the next unexpected danger may do them in.

Complexity is against overall calculability of risk. The number of potential dangers must be infinite; no one can possibly be aware of but a small fraction of the actual (let alone potential) causes of damage. The hundreds of thousands of chemicals about which so

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much is said are more than matched by the diversity of the causes of war or the afflictions of poverty or religious and racial strife. Just trying to think of the categories of objects about which a person might be concerned is a major risk. Indeed, mental health might appear to require limiting rather than expanding sources of concern. Since no one can attend to everything, the point is that there has to be some sort of priority established among dangers, or just counting risk objects would leave us all defenseless. How are the risks to which we do pay attention selected?

If whole countries were risk prone or risk averse, investigation would center on what one country's people had in common and on what differentiated them from people in other countries with a different attitude toward risk. Suppose, however, that different people within the same country had different attitudes toward risk regardless of the object. There would be risk-averse and risk-taking people no matter whether the object was impurities in drinking water or crime or unemployment. Research would focus on the characteristics that divided people with positive from people with negative feelings about risk.

There is a third possible distribution of attitudes toward objects of risk, namely, that the same individuals manifest different attitudes toward different objects of risk. Thus, some people are worried about attack by a foreign enemy while others are concerned about nuclear accidents at home. And the same people who would act to ward off air pollution might be unconcerned about the risks of declining national productivity. Instead of studying objects of risks alone or people with shared attitudes by themselves, therefore, the two (attitude and object) would be studied together: What makes some people risk takers on this (and risk avoiders on that) object of interest? Kinds of people (the social aspect) and feelings about danger (the risk aspect) would be joined together.

Risk may be "out there" in the physical world and not "in us" in society. It is possible, of course, that the public perception of risk lies entirely in the objects of attention that have apparently grown more dangerous. Possible, but not probable. All over the Western world, people are deeply divided about various kinds of dangers. Turning to experts is not much help because they also are divided. Now if citizen and expert were agreed that doubts could be left to future disposal by trusted economic and political processes, the difficulty might disappear. Yet it is precisely pervasive mistrust that characterizes processes designed to resolve issues about risk. Are the technologies mistrusted because they are too dangerous or are

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they deemed dangerous because the institutions that control them are mistrusted?

It attitudes toward risk were inherent in objects of concern, such as new technologies, it would be impossible to explain why different people disagree so strongly or why dangers that were accepted in the recent past have come under such severe sanction today. Can it be that recent technology disrupts traditional patterns more than the electric light or telephone or automobile or the whole panoply connected with the Industrial Revolution? It makes little sense to argue that it is knowledge available to everyone that causes this person to welcome large technological risks and that one to reject technological risk entirely.

At the elite level of public debate, actors — political parties, interest groups, government officials — do not uniformly attach the same dangers to different objects. People who are most concerned about attack from abroad, for instance, tend not to be as worried about pollution at home. Those who would take strong steps to counter violent crime in the streets are not equally concerned about the effects of inequality of income. Why not?

A first cut at an explanation is that participants who prefer existing social relations (and the political and economic processes supporting them) see danger in external invasion and internal attack on a good way of life. Those people who view current social relations as seriously flawed tend by the same token to reject the economic and social processes that support them. They see violent crime as the consequence of an unjust social order. If they were concerned about crime, it would be of the white collar variety, committed by their social opponents. Indeed, if there were risk from foreign policy, it would stem from the warlike preparations of a corrupt establishment designed to maintain itself in power by creating war scares that also serve to keep down domestic protest.

No doubt events from crime to international incidents are part of the argument in building a persuasive case about what dangers deserve attention. But these facts, partly because there are so many of them, do not carry their own interpretation. Otherwise there would be virtual unanimity on how to interpret them, and that is not so. Rather, the risks and evidence bearing on them are appropriated to preexisting frames of reference. These cultures (or the shared values and practices they justify) order people's perception of danger. Culture connects how different people want to live with their willingness to accept or reject risk. The objects of concern are selected according to whether and to what degree they are

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believed to protect a preferred way of life. If values dominate the choice of risk, does that mean there is no place for facts?

Facts and Theories

Danger is not a direct observation of the senses but an inference. Since each individual's experience is severely limited, he must have some framework or theory connecting his observations to conclusions. This theory cannot come from science, for reasons beyond its necessarily limited knowledge and scope. Science is concerned with explanation and prediction, not evaluation. Even in its own realm, science depends on the one thing lacking in the controversy over risk: Agreement on what is to be counted as evidence.

To see is not necessarily to know, for what we see depends on what we want to know. Almost tautologically, "facts" are facts because we treat them as facts, relative to other statements. Appeal to the facts to resolve disputes is possible only when there is *prior* consensus, both as to the implicit conceptual framework (the language of discourse) and the rules of resolution. Though no statement is immune to revision, we must agree to hold some statements stable if we seek reconciliation on the basis of facts. If everything were up for grabs all the time, if fundamental questions were raised with every new experience, progress through incremental adjustment would cease.

What do those organizations whose survival depends on correct calculation — capitalist firms — do about comprehensive calculation? If it were possible to eliminate uncertainty, thus having foreknowledge of the future, everyone (and therefore no one) would be rich. Firms and divisions and product lines, even entire industries (viz. automobiles) would never fail. The name of the game is acting without being able to know the probability or often even the kind of consequences.[5]

It is no exaggeration to say that the main task in theorizing or analyzing or explaining is what to leave out. The power of theory is determined by how much is accounted for by how little. Of all the possible factors that might be involved, only a few can be chosen. Otherwise, the confusion in what is to be understood would merely be mirrored in the theory designed to illuminate its subject. When analysts seek to design policies, they are able to manipulate only a few variables. To do more would leave them unable to follow their own analyses. The purpose of the standard sensitivity analyses is to

[5]Herbert Simon, *Models of Man* (New York: Wiley, 1957).

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determine whether their conclusions would be altered by a change in the many assumptions they are required to make in order to keep their analysis manageable. Viewing individuals going through an ordinary day, it is apparent that they cannot base their actions on investigation. Most things have to be taken for granted. The facts to which they pay attention must be severely limited by narrow frames of reference. People, like the man in Dostoevski's *Notes from the Underground* who seeks the cause that lies behind the cause that lies behind other causes, are immobilized.

Something has to be added to make the world intelligible to people. If we cannot know the risks we face, what theory or organizing principle helps us cope? On what bases are decisions made about what to leave out (what risks to ignore) as well as which ones to confront? The single most radical simplifying device is society itself with its institutions and processes dividing tasks and specialties. Cultures post lookouts and give warnings of danger just as assuredly as armies post pickets.

Cultures As Theories

Cultures are theories; they organize experience. If everything is possible, without constraint, there is no need to choose and no way to think, because no act interferes with any other. If nothing is possible, everything being constrained, there is also no way to choose and no point in thinking. In between constraint and possibility, theories tell us what to take for granted (the assumptions) and what to test (the consequences). Dogma — assuming most things — facilitates skepticism — testing a few things.[6] The impossibility theories of science, stating what cannot happen, are mirrored by the shared values of cultures, telling members of society what ought not occur. Physical impossibilities and moral imperatives serve the same purpose, namely, holding sufficient aspects of life constant to permit a narrower range of hypotheses about what works in physical or social life to be tested.

Theories and cultures are resistant to change. At any time there exists evidence that appears to contradict prevailing paradigms of how to organize experience. Resistance to change is essential or meanings would fluctuate so rapidly that no person would know how to behave toward any other. Anyone can undertake a personal experiment by questioning all social forms, asking for evidence of

[6] See the section on "Dogma and Skepticism" in Aaron Wildavsky, *Speaking Truth to Power* (Little, Brown & Co., 1979).

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identity, trustworthiness, morality and the like, discovering for himself how rapidly life becomes intolerable. Similarly, turning the physical universe into random events — one day it is this way and another that way — would make the cumulation of knowledge infeasible.

Resistance to change may be overcome. As evidence builds up against theories or cultures do not pay off for adherents, there may be defections. Rival theories or different cultures come into contention. The ways in which people live are being tested in daily life no less than in laboratories.

On the scientific side, for centuries there has been a movement to replace man as the passive receiver of physical laws, imposed on him, as it were, from the outside world of nature, with man as the active organizer of his consciousness. This organizing is done by theories that direct attention to different aspects of reality. Even if these theories succeed for a time in organizing perception of a range of phenomena, there is always the possibility (as Einstein did with Newton) that more powerful theories will replace or subsume them.

Thinking of social relations as grand theories enables us to understand how change takes place. These theories are hypotheses tested by experience as individuals observe day by day whether it makes sense in helping them through life. Evidence plays its part. Information about what works and what does not cumulates. As in scientific activity, of course, there are always experiences that appear to run contrary to the prevailing paradigm. Life (or science) cannot stand still while each and every one is tested. Otherwise there would be no stability. As anomalies accumulate, the individuals involved consider whether other theories or ways of life might be superior. It is not that one fact is true and another false but rather that one theory with its associated facts replaces another.[7] Though individuals are not necessarily experts on cultural theory, they are the only experts on their own lives. As Karl Popper recapitulates his now classic work on *The Logic of Scientific Discovery,*

> All observations (and even more all experiments) are *theory impregnated:* they are interpretations in the light of theories. We observe only what our problems, our biological situation, our interests, our expectations, and our action programmes, make relevant. Just as our observational instruments are based upon

[7]The same sort of discussion may be traced through the large literature surrounding Thomas Kuhn's *The Structure of Scientific Revolution* (Chicago: Univ. of Chicago Press, 1962). For a view corresponding to my own, see Stephen Toulmin's *Human Understanding* (Oxford: Clarendon Press, 1972).

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> theories, so are our very sense organs, without which we cannot observe. . . . Theories come before observation and so they cannot be the results of repeated observations.
>
> The theory of induction by repetition [i.e. experience as sense perception] has thus to be replaced by the theory of the tentative variation of theories or action programmes and their critical testing, by using them in our actions.[8]

Culture is a contract. If the terms are violated, the parties may back out. In the cosmology of the Micmac, a hunting people in eastern Canada in the 1500s, there was presupposed mutual respect between the hunters and the hunted. Who could kill how many of what animal was carefully prescribed. The penalty for violation was the retribution of the spiritual game boss summoned through the shaman. Yet those who came after the first French traders observed the Micmac acquiring pelt upon pelt like a miser hoarding his money. What happened was that smallpox or some disease brought by settlers, thought to be transmitted among animals, virtually exterminated this people. So they broke their cultural contract. Since the animals had broken faith, the Micmac would also declare war, butchering every one in sight, a war made possible by access to more modern technology and the rewards that flowed from the skins.[9]

The different forms of social relations (we call cultures) direct their adherents' attention toward certain dangers and away from others. Since it is not possible for any person to know more than a small fraction of the dangers he confronts in the present (let alone in the future), he must proceed according to an attention rejecting and directing framework. This most comprehensive of all social theories — culture itself — organizes perception of the immense areas of uncertainty that necessarily surround the subject of social safety.

What matters to people is how they live with other people. The great questions of social life are "Who am I?" (To what kind of group do I belong?) and "What should I do?" (Are there many or few prescriptions I am expected to obey?). Groups are strong or weak according to whether they have boundaries separating them from others. Decisions are taken either for the group as a whole (strong boundaries) or by individuals or families (weak boundaries).

[8] Karl R. Popper and John C. Eccles, *The Self and Its Brain* (New York: Springer-Verlag, 1977), pp. 134-35.

[9] Calvin Martin, *Keepers of the Game: Indian-Animal Relationships and the Fur Trade* (Univ. of California Press: Berkeley & Los Angeles, 1978).

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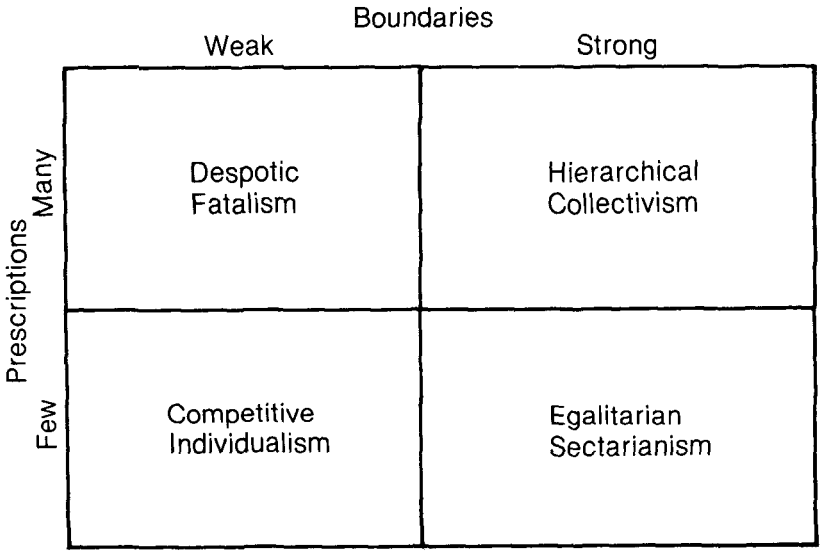
Prescriptions are few or many indicating that the individual internalizes a large or a small number of behavioral norms to which he or she is bound. By combining boundaries with prescriptions, following Mary Douglas,[10] the most general answers to the questions of social life can be combined to produce four different cultures.



Starting with the culture from which libertarianism comes, competitive individualism has few prescriptions and weak boundaries. The only rule is that coercion should be limited to the protection of person and property, justly acquired. Hence, under individualism, individuals are free to pursue their own interests provided they don't interfere with the equal rights of others to do the same. Individualism is a market culture because individuals cooperate via free and, therefore, mutually beneficial exchange. In this culture, based on private property and competition, losses are imposed on those individuals who are unsuccessful in satisfying consumer preferences at least cost. Such individuals will bear the risks of their use of society's scarce resources.

At the opposite end of the cultural spectrum is hierarchical collectivism — strongly bounded groups with many rules. Here hierar-

[10] Mary Douglas, *Natural Symbols: Explorations in Cosmology* (London: Barrie & Rockliff, 1970); "Cultural Bias," from Occasional Papers of the Royal Anthropological Institute, No. 34 (1978); and Mary Douglas and Aaron Wildavsky, *Risk and Culture*, forthcoming (Univ. of California Press, 1982).

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chies divide tasks minutely, each status living by the rules assigned to it. Although hierarchy evidently involves power asymmetry, it is not totalitarian. The "lowerarchs" have rights vis-à-vis those above them who are not allowed to reach down and occupy their space. (The sergeant in John Ford's westerns who, sitting in his own home, kicks out the commanding officer for entering without permission, makes the point.) Concerned with the relations between parts and whole, hierarchies inculcate a sacrificial ethic. (Of course, individualists would regard these sacrifices for the collective as forced.) Personal risks may be undertaken for group gain. Conversely, those who play by the rules may expect the group to cover their losses. In hierarchies, reciprocity consists of a network of obligations, stretching from past to future, each generation honoring the commitments of those who came before and making commitments to be made good by those who come after.

Sectarianism is the usual name for the culture comprised of the small, egalitarian groups that are bounded strongly but have the fewest possible prescriptions. Social organization is to be entirely voluntary without coercion or authority. Risks are taken only for the group, and gains are equally distributed by prior consent. Egalitarianism is emphasized, for this is the only way in which individuals within a collective can relate to one another without authority. Thus reciprocity for egalitarian sectarians consists of relationships in which no one exerts more influence than another.

Finally, a culture of despotic fatalism comes from a combination of weak group boundaries and many personal prescriptions. This is the culture of which it can properly be said that individuals have no control over the rules that run their lives. For fatalists there is no reciprocity, no mutuality, no sharing. Lacking power, fatalists believe either in luck or in submission. The individual does not take risks for himself or for others but because it is his fate.

Let us change this categorical conception to a dynamic view of cultures in contention. The commitment of individuals to a concrete culture depends on its ability to provide satisfaction compared with alternatives. Thus, cultures seek both to differentiate themselves from other ways of life and to demonstrate their superiority. Differentiation requires coherence. Internal social relations should correspond to ideals, and these norms ought to rationalize (justify, make sense out of) the desired structure of social relations.

The struggles between collectivism and sectarianism, hierarchy and equality, are epic-making. Sectarians reject the hated hierarchies of collectivism to the point of separating themselves from

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societies tainted with that curse. The forced marches of these sects are famous in world history.

When they remain within a larger, multi-cultural society, sectarians form the perennial critical culture. They exist not to be satisfied. How, otherwise, would they keep their people together without authority? By ceaselessly condemning the world outside, its callousness and coercion, sects stay together, for they fear the ceaseless splits that characterize their culture. According to a sectarian worldview, markets are twice tainted, once because their transactions lead to unequal rewards and again because anything except the right to bid and bargain is negotiable. Collectivism is condemned on its face for its inequalities, whether these mask themselves as expertise (scientists know best) or bigness (multinationals) or just industry, which, in its internal operations, embodies technology.

Competitive individualism abhors controls on voluntary exchange and the resulting distribution of income. What would happen to markets if the gains were collectivized? Worse still, what would happen to incentives if gains (but not losses) had to be redistributed? If individualism is opposed to collectivism, which does not allow equality of opportunity (though it may still honor the rule of law), individualism is even more opposed to sectarianism because it insists on equality of results. What is the point of competition if there can be no winners? How can there be serendipity — new combinations satisfying a wider range of preferences — if there can be no losers? Since hierarchy depends on acknowledging the legitimacy of its relative ranks and individualism depends on the desirability of competition, neither takes kindly to their perennial critics who deny what is most essential for their followers to believe.

Now, what has all this to do with pollution? Everything. When this discussion is done, everything important about pollution will have been said. Only the technical details will be left.

Risk and Pollution as Weapons in the Cultural Wars

People think through actions and objects as well as through categories of scientific thought. It we hear that chemicals are carcinogens and nuclear waste is industrial excrement, that nature is natural, pure and perfect, whereas technology upsets the delicate balance of nature, that sunshine is a disinfectant in politics and sunsets close the curtain on the big bad bureaucracy, that solar energy is close to salvation, these symbols speak to us in strange

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tongues. Mastery of nature, including the Biblical injunction for nature to serve man, gives way to subordination. Foods are to be natural (meaning untouched by technology) and man is to be abstemious by not demanding too much. Why is there so much pollution nowadays?

In anthropology the subject of pollution (also called defilement or impurity) is treated as a belief in undesirable qualities transmitted physically. Pollution implies a mechanism of contagion, whether genetic or bacteriological or more mysterious in its workings. When we speak in other contexts of river pollution or air pollution, the physical element is clearly implied. But pollution also carries the idea of moral defect. If it were not morally loaded, it would not be useful in argument. If you want to get your spouse, a local level pollution, say adultery, may be sufficient. If you want to bring down the government, however, a national level pollution, making the highest officials and the most major institutions culpable and accountable, is necessary. Nuclear energy is chosen for opprobrium not because existing evidence indicates it is the most dangerous compared with other sources of energy, quite the opposite (see Bernard Cohen's excellent paper),[11] but because it is most useful for symbolizing opposition to existing social and economic relationships. Dangers may be alleged to be hidden, involuntary, and irreversible. Nuclear plants are massive, thus attacking bigness, and their consequences may affect large numbers of people, thus enhancing accountability. The idea that corporate capital is doing people in, thus implicating the entire establishment, is more plausible in the nuclear field than in any other.

The distinctive character of a pollution situation is that it combines a natural mechanism of dangerous contagion with a moral idea. To recognize pollution means using the idea of dangers inherent in nature as a means of moral coercion. As a result, arguments about new technology may be used as arguments about how the good society should be structured.

Occasional complaints about pollution may have physical causes. Across-the-board condemnation of contamination of nature and people by technology has no direct physical cause. Pollution is being used as a political weapon against individualism and collectivism (hierarchy) by advocates of sectarianism. There is more to it than that, but not much more. Instead of a hopeless counter-factual quest for the material causes of a nonexistent increase in en-

[11] Bernard L. Cohen, "Radiation Pollution and Cancer: Comparative Risks and Proof," *Cato Journal* 2 (Spring 1982): 255-274.

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vironmental and human damage, therefore, it is wiser to ask the cultural question: What kind of culture routinely invokes nature and the natural in defense of its own way and in opposition to contrary cultures?

In a culture of competitive individualism, risk is opportunity. Without scarcity there is no competition; without uncertainty, there is no reward. If everything important can be known in advance, central control to assure correct decisions, rather than social interaction to secure agreed outcomes, would be optimal. Serving oneself by serving other people, which is the moral justification of individualism, rewards being given for meeting the most widespread preferences, assumes they cannot be known in advance. Markets are based on a retrospective rationale; were it possible to program interactions in advance, planning would be preferable. Libertarians like markets not because they know in advance how things will turn out but because they don't. It is only by looking backwards and observing that resources were allocated to higher-order uses, satisfying a broader range of consumer preferences, that markets are deemed superior to central planning.

Where fatalists accept risks because there is no alternative, collectivists seek to spread them out. Short-term risks are parceled out according to one's predetermined place in society and long-term risks are willed, so to speak, to future generations. Because they believe that their form of social organization will last, each generation doing its duty to its predecessors and successors, collectivism proceeds according to the principle of "sufficient unto the day is the evil thereof." Collectivists are technologically optimistic partly because production has so far been hierarchically organized, but mostly because they expect future generations to correct their mistakes as they have done in regard to those of their predecessors.

Insofar as the risks flowing from technology are concerned, therefore, collectivism and individualism are allied, though for different reasons. Individualists are optimistic because they believe they have a method of social organization that does not require infallible knowledge of an inherently uncertain future. Collectivists are optimistic; either they think they know the secrets of the future or that their successors will. This line of reasoning explains why, on the issue of technology, communists and capitalists are allied.

Sectarians are technological pessimists. They are pessimistic about technology because they are opposed to the social structures for which it stands — hierarchy and competition. They prefer little to big technology for the same reasons they oppose the big organiza-

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tions of corporate capitalism to their small collectives. To say this much, however, is only to push the question of risk back to its essential cultural constituents: Why do supporters of sectarianism see catastrophe from technology coming around every corner? How can we explain the sudden sense of impending doom that has swept across our country?

The "Armageddon complex" — the bringing forward of immense future risks into the present, as if there would be no tomorrow — is a direct consequence of the increasing strength of sectarian culture. By now the litany is familiar; the earth is exceeding its carbon budget, oxygen is being depleted, the population is exploding, thermal inversion threatens to burn us to a crisp, or hiding the sun's rays to freeze us to death, on and on. Why all these alarms?

Sects, organized as small egalitarian groups, are perennial outsiders. They are organized against the hierarchy and competition that leads to inequality. They cannot rule, except for brief periods, because they cannot solve the problem of authority. They tend to split, either because they will not acknowledge leaders or the charismatics they prefer tend to drive out rivals. What they can do is criticize the establishment, whether it be collectivism or individualism or some combination thereof. Being small and critical, however, they are often on the defensive. Sectarianism needs a strategy that will keep its members together and will threaten the stronger establishment. With what? With doom. If machines are broken, they can be repaired. If a given technology proves defective, it can be replaced. But if the threat is to human life itself, or to the natural environment that sustains life, incremental adaptation is ruled out. Only radical change toward sectarianism will save the day, indeed, the planet.

Risk is an especially good issue because it is so easy to remain dissatisfied. Proof is extremely difficult, if not impossible. If the hazard does not materialize immediately, it will get you later on. As new knowledge reveals old risks to be negligible, new ones rise to take their place. When the anger against existing institutions is strong enough, no deaths can be considered natural. The only question then, to quote the title of a recent book, is "Who is Poisoning America?"[12]

Sectarianism is not unique in using coercive arguments to keep its adherents in line; all cultures seek conformity even if it is expressd as nonconformism. Collectivism reinforces hierarchy by claiming

[12] You guessed it, the corporations. Ralph Nader, Ronald Brownstein and John Richard, eds., *Who Is Poisoning America?* (San Francisco: Sierra Club Books, 1981).

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its distinctions are God-given. Individualism would not dream of ordering anyone around; it is just that there is no alternative because money has run out. What makes sectarianism of special interest, however, is its use of pollution (Mother Nature won't allow that!) as a means of moral coercion.

Pollution (from a cultural viewpoint) is a problem only for those cultures that have boundaries to protect. Cultures with soft shells, open to outside influences, know no pollution because they need no guards to protect nonexistent borders. Where life is fate, outsiders make rules for insiders who have no means of self-defense. Individualists make a virtue out of necessity by profiting from the removal of social boundaries. They create new markets where none existed, refusing to accept a priori definitions of permissible transactions other than the consent of the people involved. Individualism conflicts with collectivism exactly on the issue of boundaries as the latter seeks to make its hierarchical division of labor sacrosanct by forbidding bargaining about role and status.

Pollution is a problem for collectivism and for sectarianism because both seek to protect social boundaries, though in regard to different transgressions. These hardshell systems differ according to whether they seek to safeguard innumerable inequalities or a single standard of equality. Hierarchies have so many distinctions to protect that they are forever inventing imaginary dangers about women taking on men's roles or children challenging parents or the wrong sort of people getting married or someone without the allegedly essential qualifications doing a job. Concentrating their concern on a single wall of virtue — equality — sectarians invest breaches of that wall with infinite evil. Somehow the fragile web of nature will be disrupted, leading the entire ecosystem on which life depends to cascade out of control. Only transactions that increase equality, as in John Rawls' formulation of the difference principle,[13] operate in accord with nature, i.e., a culture without distinction. Theirs is not Walt Disney's competitive nature of tooth and claw but some original state of nature before the Great Satans, collectivism and individualism, hierarchy and competition, unfortunately entered the world.

Pollution, big and bad, is a blanket condemnation of soft-shell cultures. Libertarians might share the disavowal of fatalism (Who wants to be subject to rules made by others that they cannot modify?) but they cannot condemn individualism without doing themselves in.

[13] John Rawls, *A Theory of Justice* (Cambridge, Mass.: Belknap Press of Harvard Univ. Press, 1971).

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Am I suggesting that there is no difficulty with physical pollution so libertarians need not pay attention? I am not. I am saying that libertarians should be aware of the destructive implications for their way of life of accepting accusations of across-the-board pollution. Libertarians will want to approach pollution from their own point of view. They should be interested in altering property relationships so as to reduce the power disparities between polluters and the polluted, or, in more familiar terms, to internalize externalities. This rearrangement takes time and cannot be entirely successful. No instrument of policy is good for all purposes; no actions are without their reactions, some of which are bound to be unanticipated.

What, then, should libertarians do about the last remnant of pollution that cannot be eliminated? Adopting the stance that future combinations as yet unknown will eliminate the difficulty, or that future discoveries, encouraged by scientific competition, will find a cure, libertarians may ignore minor, uncompensated pollutions. No market-oriented economist would argue for zero pollution. Alternatively, libertarians could decide that pollution is their blind spot. Since no one can see things whole, every culture being a form of bias, compensatory measures can be taken. A pollution budget could be established, for example, seeking to alleviate uncompensated damages in some sort of priority. By placing a fixed financial limit on attempts to anticipate dangers before they arise, a sectarian solution is avoided, while still allowing efforts to ameliorate those pollutions that get away.

If a pollution budget is a permissible prudential exception allowing governmental action to mitigate pollution, why not go all the way into comparative risk assessment? If risk of pollution by toxic substances could be ranked according to common criteria, the worst ones, which remain uncompensated, could be regulated. An idyllic scene. But one that cannot be accomplished with complete consent. Indeed, if it were possible to agree on comparative criteria for ranking risks, decisions would be preprogrammed, emerging as if untouched by human hands. None of this will receive widespread acceptance.

Stipulation as to the correct criteria or the rules of ranking cannot be agreed upon without giving up the game. If money were used as a medium, or if one death or injury were considered equivalent to another, or if some level of risk (say, smoking a cigarette or eating a charbroiled steak a day) were considered minimal, so as to serve as a lower level below which risks were tolerable, pollution would become a technical and not a political problem. It would only be a

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matter of price. Once the criteria can conceivably be met, the issue of risk would no longer stand as a rebuke to the establishment.

Does evidence not matter? Libertarians would not like to think of themselves as people who disregard evidence in favor of ideology, an accusation they are wont to level against their opponents. Can libertarians guarantee there are no unexpected dangers? Of course not. May not a substance that appears benign (like asbestos) later turn out to be harmful? Of all people, libertarians must be among the first to agree to the ubiquity of the unexpected. Why, then cannot the expected, working its will silently through the human system, emerge 20 or 30 years later as a cancerous contamination, wreaking its unspeakable horror upon a surprised citizenry? No one can deny this is possible. No one can deny that the regular relationships on which we build our lives, will not, for reasons we cannot anticipate, fall apart. How, then, can we cope with the unexpected?

In the few areas where we know a great deal, we may directly assess risks, but in most areas we cannot. Since we cannot know the risks we face, the question is, how shall we compensate for our ignorance, by anticipation or by resilience? If the world is coming to an end because of the depredations of individualism, a massive effort to head off destruction may be justified from a sectarian perspective. If one trusts markets to come up with appropriate solutions that no one today envisions, it is better to wait so as to respond resiliently to the unexpected.

Conclusion

A reader of Bernard Cohen's paper, who learns that much more is known about radiation than about most subjects, will understand that if there are deep divisions where mankind is most knowledgeable, there must be more to it than just the data. What is it, I have asked, that people bring to the data? What theory organizes the perceptions of risk? This theory, I have argued, is culture: Our hopes and fears, our sense of danger and safety, depend on our ways of life.

The basic risk-averse arguments are that dangers are hidden, involuntary, and irreversible: People are deliberately kept in the dark; they would not face these risks if they knew about them, and they will suffer death or damage from which they cannot recover. Now a nice society would never do that. Any society "guilty as charged" would be vile. In the past these arguments were countered by their opposites. Who argues that *benefits* are hidden, involuntary, and irreversible? Hidden in that no one sees them for

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what they are; involuntary in that no one intends the benefits; and irreversible in that riches will follow if only the rules are obeyed. I refer, of course, to Adam Smith's *Wealth of Nations.* Risk taking and risk aversion are forms of social commentary.

But this is not to say that evidence is immaterial. It is not. Evidence can never be conclusive, because there is always more to come. Not one anomaly but many are required before people begin to wonder whether their way of life might need modification. Sometimes certain evidence acquires the force of conviction, which is to say there is widespread agreement. But this conviction and agreement is absent in regard to the question of pollution. Since pollution is a contested concept, Murray Rothbard, writing as a libertarian, comes to the correct conclusion by insisting on stringent standards:

> . . . if air pollution is evident to the senses — either visibly or by emitting a noxious odor — then the pollution is a tort *per se* because it interferes with the possession and use of property by its owner. But the invisible and insensible crossing of another's air boundary — say by radio waves or low-level radiation — cannot be considered aggression because it does not interfere with the owner's use or enjoyment of his person or property. Only if such a boundary crossing commits provable harm — according to principles of strict causality and beyond a reasonable doubt — can it be considered a tort and subject to liability and injunction.[14]

Unless libertarians want to consider themselves as the source of social contamination, pollution cannot be their major problem, as it is for sectarians. Otherwise, libertarians can only answer Geoffrey Vickers' question — "Has Man Become a Cancer?"[15] in the affirmative, adding only that they are the cause.

[14] Murray Rothbard, "Law, Property Rights, and Air Pollution," *Cato Journal* 2 (Spring 1982): 55-99.

[15] Geoffrey Vickers, "Has Man Become a Cancer?," *Town Planning Review* 52 (April 1981): 205-214.

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WILDAVSKY ON POLLUTION AS MORAL COERCION: A COMMENT

Manuel S. Klausner

Professor Wildavsky's paper makes a useful and original contribution to the pollution debate, particularly in terms of understanding how pollution is perceived culturally and how it is used politically. He offers key insights into the use of pollution as a means of moral coercion, especially in the area of nuclear energy.

Wildavsky quotes at length from Peter Aranson's chapter in *Instead of Regulation,* which he considers "the best recent exposition" of the libertarian position on pollution. The excerpt from Aranson focuses on "government failure" in addition to the notion of "market failure," and demonstrates why it is mistaken to automatically call for government intervention in the presence of externalities.

Wildavsky's thesis is that libertarians ought not overreact to sweeping allegations of widespread, across-the-board pollution as voiced by members of a culture he labels "egalitarian sectarianism." He effectively shows how "egalitarian sectarians" use the moral overtones of pollution as a political weapon.

Wildavsky's major theme recognizes that pollution is a problem for libertarians and that the libertarian approach is to develop new rules about property. He cautions, however, that pollution cannot be a major problem for libertarians in the sense that it is for sectarians.

But what does Wildavsky mean when he contends: "Properly understood . . . libertarianism . . . knows no pollution"? (p. 307) Obviously, Wildavsky doesn't intend to raise a vision of Ayn Rand standing over tall smokestacks and deeply inhaling. Rather, he explains his contention by observing: "If there are no boundaries

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against transactions — competitive individualism tears down rather than builds up boundaries — there can be no pollution." Similarly, he implies that, for libertarians, "there are no legal limits on transactions." (p. 305) Wildavsky, however, should be careful not to blur the distinction between voluntary and involuntary transactions. His statements are incomplete (as Wildavsky himself would seem to recognize in other contexts in his paper), because they disregard the significance of consent. The essence of libertarianism is its insistence on permitting consensual transactions, but not legitimizing involuntary transactions.

There is another dimension to Wildavsky's formulation. In contending that libertarianism, "properly understood," knows no pollution and that libertarians should not accept accusations of across-the-board pollution, Wildavsky uses an approach which echoes that of Thomas Szasz. Professor Szasz' thesis that there is no such thing as mental illness — but the notion of disease is used as a strategy in dealing with personal problems — has been a useful tool in helping avoid the mythology and misunderstanding associated with the concept of mental illness.

In a sense, Wildavsky's perspective in this regard is reminiscent of Walter Block's approach turned on its head. In Block's provocative *Defending the Undefendable* (New York: Fleet Press, 1976), he holds out as heroes such people as drug pushers, gypsy cab drivers, slumlords, and litterers. For Block, the litterer is a hero because he litters only in a public area.

Block explains that littering can only take place in a public domain, but never in a private domain — since conduct resembling littering that occurs in the private domain is considered to be garbage, dirt, or waste — but not litter.

Walter Block's general thesis is that there is a moral difference between the initiation of aggression and all other acts which, although they may be displeasing, do not involve aggressive violence, which violates a person's rights. Therefore, Block claims that such people as litterers and drug pushers are scapegoats, or available to attack, but who must be defended in the interests of justice since they engage in voluntary transactions and are nonaggressors.

Just as Walter Block has provided a new perspective on litterers, Wildavsky provides a fresh insight into anti-pollution sects. For Wildavsky, libertarianism knows no pollution, and, in contrast to Block's view of the litterer as heroic, Wildavsky sees the anti-pollution sect — which attacks individualism and the market economy by saying "the environment is polluted" — as an

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adversary.

Within the framework of his major theme, Wildavsky offers numerous insights into competing cultures. His description of sectarianism is particularly revealing:

> By ceaselessly condemning the world outside, its callousness and coercion, sects stay together, for they fear the ceaseless splits that characterize their culture. According to a purely voluntary [sectarian] world view, markets are twice tainted, once because their transactions lead to unequal rewards and again because anything except the right to bid and bargain is negotiable. (p. 318)

Wildavsky points out that sectarians make accusations of across-the-board pollution as a blanket condemnation of the culture of competitive individualism and for use as a political weapon. Wildavsky effectively shows that sectarians use pollution as a strategy of doom. Sectarians need the constant cry that pollution threatens human life, and the planet itself, in order to keep their members together — and to threaten the stronger establishment.

Wildavsky's attack on the sectarians is sharp and well aimed:

> What makes sectarianism of special interest . . . is its use of pollution — (Mother Nature won't allow that!) — as a means of moral coercion. (p. 322)

He points out that the "distinctive character of a pollution situation is that it combines a natural mechanism of dangerous contagion with a moral idea." (p. 319)

As Professor Wildavsky suggests, proof is "extremely difficult, if not impossible" in dealing with issues of hazards from pollution. He notes the argument that:

> If the hazard does not materialize immediately, it will get you later on. As new knowledge reveals old risks to be negligible, new ones rise to take their place. When the anger against existing institutions is strong enough, no deaths can be considered natural. (p. 321)

Wildavsky then cogently notes that "the only question left," as posed by Ralph Nader in the title of his recent book, is "Who is Poisoning America?" And what would Nader's answer be? According to Wildavsky, "You guessed it, the corporations." (p. 321)

Wildavsky identifies competitive individualism as the culture from which libertarianism is derived. Beyond Wildavsky's generally useful discussion, I would add the observation that libertarians — from a cultural perspective — could be characterized as forerunners. In this regard, they tend to be open to new ideas, but not

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because they are trendy. Rather, libertarians tend to favor ideas for their intrinsic merit.

In his thoughtful description of individualists, he properly describes them as "optimistic," although it would not be philosophically inconsistent for a libertarian to be a "doomsdayer" so long as there is no advocacy of remedies involving the initiation of coercion. Libertarians, however, tend not to heed — and certainly do not need — the doomsday strategy that Professor Wildavsky observes is needed by the sectarians.

Beyond Wildavsky's many valuable insights into the dynamics of competing cultures, there are some discordant notes. For example, in discussing the libertarian approach, Wildavsky overstates the likelihood of developing rules and markets that will fully internalize externalities. Libertarians recognize that the world is full of externalities created by consumption and production. But they would not insist on incurring the disproportionate cost of attempting to abate all such externalities.

Wildavsky suggests that for libertarians "failure [on the part of some market participants] is more important than success in that it leaves the way open to try new and better combinations that meet more widespread preferences." (p. 305) Failure may indeed serve a positive purpose, as observed by Wildavsky, but there is no reason why libertarians should regard failure either as necessary or more important than success. On the contrary, new and better combinations can evolve from today's successes, as well as from today's failures.

In the same vein, why does Wildavsky ask, "What is the point of competition if there can be no winners?" (p. 318) For libertarians, the point is that competition maximizes liberty by expanding options. The process thereby yields both winners and losers, thus allowing for major redistribution of wealth. It is also significant for libertarians that the alternative to competition is coercion. Wildavsky in general seems to take a rather negative approach to the impersonal forces of the market and the results created by what Hayek describes as the "spontaneous collaboration of free men."[1]

In describing why libertarians like markets, Wildavsky states they do so "not because they know in advance how things will turn out but because they don't." (p. 320) Although this aspect is a characteristic of markets, it is imprecise to consider this to be the main attraction of markets to libertarians. Libertarians, above all, have a

[1] Friedrich A. Hayek, "Individualism: True and False," in *Individualism and Economic Order* (Chicago: Henry Regnery Co., 1972), p. 7.

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moral repugnance against any coercive narrowing of options. It is a secondary attraction that markets are efficient in terms of providing optimum knowledge to decision-makers.

Wildavsky asserts: "It is only by looking backwards and observing that resources were allocated to higher-order uses . . . that markets are deemed superior to central planning." (p. 320) I would add that the benefit of a market system is that it encourages individuals to exercise their foresight. The price and profit system penalizes inefficient uses of resources; market participants therefore have an incentive to consider the *future* consequences of their present uses of resources. Thus, markets are superior for libertarians, but not merely on a "retrospective rationale" as Wildavsky claims.

It is interesting to note that Wildavsky seems to think that planning and libertarianism (free markets) are inconsistent. He writes: ". . . were it possible to program interactions in advance, planning would be preferable [to markets]." (p. 320) He should note, however, that the key difference between libertarianism and central planning is that in the former individuals plan on a consensual basis, while in the latter central planners impose their preferences on the rest of society. Likewise, Wildavsky appears not to understand the spontaneous order of the marketplace, in which the plans of individuals are coordinated via the price mechanism. The issue for libertarians is not whether or not to plan, but who should plan — private parties or the state.

Wildavsky offers a rather curious proposal that libertarians could decide that pollution is their "blind spot" and establish compensatory measures such as a "pollution budget." He goes on to suggest that if a "pollution budget" were permissible, then "why not go all the way into comparative risk assessment?" and regulate the worst uncompensated forms of pollution. (p. 323) These suggestions are ill-considered. Aside from serious libertarian objections to the notion of developing a "blind spot" exception for otherwise illegitimate coercion, the task of determining the criteria for such measures seems futile in a dynamic economy with ever-changing technological developments and risks. As Wildavsky himself recognizes, complete consent could not be had concerning rules for ranking risks; hence, his comment that pollution would thereby become "a technical and not a political problem" (p. 323) is illusory.

Moreover, Wildavsky's proposal for compensatory measures is at odds with the resilient approach he attributes to those who trust "markets to come up with appropriate solutions that no one today

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envisions." (p. 324) Indeed, such a proposal seems inherently premised on a sectarian perspective and is antagonistic to Wildavsky's stated views of libertarianism.

Wildavsky comes closer to the mark in endorsing Murray Rothbard's standards for imposing liability for pollution. However, although Rothbard has made a profound contribution with his article, "Law, Property Rights, and Air Pollution," he does not adequately demonstrate the appropriateness of singling out pollution for a "beyond-a-reasonable-doubt" standard of proof as against other torts, and he has yet to establish the basis for insisting on such a strick standard of proof for torts in general. Thus, Wildavsky's endorsement is premature.

The final comment I would offer about Professor Wildavsky's piece is that he overstates the concern that a "sudden sense of impending doom" (p. 321) has swept across the country. Obviously, doomsdayers are alive and well in the United States today. But, in my judgment, they are not nearly so much in fashion today as in the 1970s. Paul Ehrlich and Ralph Nader had a tremendous following in the 1970s. Many college students who were attracted to environmental causes in the '70s found that the technical issues involved were too complex to sustain their interest, and have moved on to other areas of greater personal concern.

There are, however, cross-currents going in both directions. There is concededly an active and outspoken anti-nuclear energy movement today. Yet this seems more than merely a consequence of the culture Wildavsky calls sectarianism. There is a rational fear among nonsectarians of the perils and costs posed by the nuclear arms race, which tends to add to the momentum of the anti-nuclear energy movement. By exploiting these legitimate fears, the anti-nuclear energy forces are able to effectively secure support from many who are not generally of a sectarian bent.

On the whole, Wildavsky has made an extremely useful contribution. To be sure, his discussion needs to focus more precisely on the voluntary aspects of libertarianism and would be strengthened by clarifying his references to libertarian values. By identifying the characteristics of sectarians, however, and their use of the pollution issue as a political weapon, he helps point the way to an effective counterstrategy. Such opponents will never be interested in reasoned debate. Instead, the need is to seize the moral initiative from such groups in making an appeal to those who tend towards an open mind.

Properly understood, libertarianism is a political philosophy,

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which values personal liberty and rejects, as immoral, the initiation of force. From a libertarian perspective, human life presents a variety of social and economic problems such as poverty, disease, and pollution. In all of these cases, the libertarian concern is for equality of opportunity rather than the utopian notion of equality of result. As Hayek has observed: "We must face the fact that the preservation of individual freedom is incompatible with a full satisfaction of our views of distributive justice."[2]

Pollution is, after all, a problem for libertarians, but one that calls for the principled application of property rights, and not an overreaction to the cries of those who use pollution as an attack on personal liberty and the free market.

[2]Hayek, p. 22.

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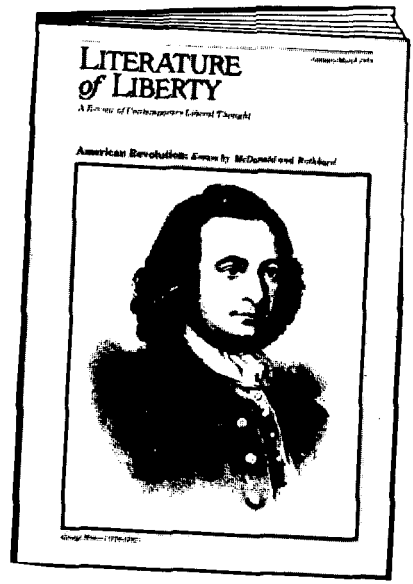

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—J.H. Dales

Pollution, Property, and Prices
(Toronto: University of Toronto Press,
1968), pp. 63-65.

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